

THE AMERICAN PSYCHOLOGIST

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THE AMERICAN PSYCHOLOGIST

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RESEARCH ON PERSONNEL SELECTION IN THE ROYAL NAVY AND THE BRITISH ARMY

P. E. VERNON

University of Glasgow, Scotland

LITTLE has been published so far about psychological work in the British Fighting Services, partly because of security restrictions, but mainly because the psychologists involved have been too occupied by the work itself. Yet the scope of personnel selection, and many of the methods used and results obtained, have been quite comparable with those described by American psychologists. For example, the most widely used test—Progressive Matrices—has been taken by some three million recruits, and a battery of five or more tests by nearly two million men and women in the Royal Navy and Army,¹ and the latter have nearly all been interviewed by trained Personnel Selection Officers (PSOs) before allocation to the job, or the branch of the Service, considered most suitable. That is to say, at least as large a proportion of the population as in America has passed through psychological selection procedure.

The main differences between British and American work have resulted first from the much smaller number of fully qualified psychologists available here, and secondly from the much lower prestige of psychology among naval and military authorities during the pre-war and early war years. Barely twenty psychologists of senior standing were obtainable as technical staff for the Admiralty Senior Psychologist's Department and the War Office Directorate for the Selection of Personnel, most of them being seconded from the National Institute of Industrial Psychology. About another twenty with some pre-war training were brought in. But

the vast majority of testers, interviewers, statistical and clerical assistants and administrators—who at peak periods numbered over two thousand—had to be trained almost from scratch as the work itself proceeded. Incidentally this meant that most of the skilled personnel were mainly engaged in organisation, propaganda and training, and that the staff available for technical research was far smaller still. In the Army roughly half of the qualified personnel were solely occupied in the development of officer selection methods.

Certain other handicaps deserve mention. Machine scoring of tests and tabulation of scores were impracticable, and though the sorting of Army recruits was done by Hollerith, the whole of naval selection procedure and almost all correlational or other statistical investigations in both Services had to be done by hand, with a limited number of electric calculating machines. Again the shortage of materials and the diversion of almost all skilled mechanics into the Services or into armaments production rendered it virtually impossible for psychologists to construct or maintain any tests involving elaborate apparatus. Even the paper shortage considerably restricted the use of tests containing spatial or mechanical diagrams and pictures.

No large-scale applications of psychology to military problems occurred in Britain during 1914-18, and the need for it was scarcely felt by the Navy and Army until the second year of this war. Moreover there did not exist, as in America, any strong central body for coordinating the efforts of psychologists, or for drawing the attention of the authorities to the contributions they could make. Hence although much work was done during 1939-41 by individuals and by University teams both for the Services, and on civilian problems such as evacuation of children, effects of air-raids, public opinion and morale surveys, psychology can hardly be said

¹ No mention will be made of the Royal Air Force, since the writer only possesses secondhand knowledge of its psychological work, whereas he was engaged on test development, validation and research projects both at the Admiralty and War Office for four years. The valuable investigations carried out for the Services by the Cambridge (4), and other University, psychological laboratories, by the National Institute of Industrial Psychology and other organisations and individuals, will also be omitted.

to have received full official recognition until the Admiralty and War Office departments were set up in the summer of 1941. Myers (9, 10) has described the establishment of the Army Directorate, and Tuck (17) gives a brief account of its activities. Garforth (6) deals with the working of the War Office Boards for officer selection. The general organisation of the Admiralty Department is covered by Rodger (13) and Straker (15), and of personnel work in the ATS (the women's Auxiliary Territorial Service in the Army) by Mercer (7). The present article is concerned only with psychological techniques and results.

TESTS

The main tests, their content, time limits, and scope of application are listed below.² Many others were tried out, or used for short periods, but discarded as less suitable, inconvenient, or poor in validity.

I. *Applied at Recruiting Centres on first call-up:*

1. Raven's (11) Progressive Matrices (20 mins.).

Used as a first sieve for all naval and ATS candidates. A non-verbal general intelligence test based on diagrammatic analogies and sequences.

2. Modified Ishihara test of colour vision, given to all naval recruits.

II. *Standard naval battery, given at New Entry Training Establishments:*

3. Modified Shipley (14) Abstraction test (10 mins.). Verbal intelligence.

4. Modified Bennett Mechanical Comprehension test (15 mins.).

5. Arithmetic: four rules (2 mins.), mathematical questions (8 mins.).

6. "Squares" test of Spatial Judgment (10 mins.). Usually added to this battery were:

7. Dictation test, one of a number of standard 35-word passages.

8. Electrical Information (10 mins.) and Mechanical Information (10 mins.). Simple-response type questions.

III. *Standard Army battery, applied at Primary Training Centres:*

Nos. 1 and 4 above, and:

²The numbering of tests used in this article is not the same as that actually assigned to the tests by the SP Department and DSP.

9. Arithmetic: four rules (6 mins.), mathematical questions (10 mins.).

10. Verbal test (16 mins.), based on synonyms, homonyms and rhymes.

11. Instructions or Clerical test (15 mins.). Checking, filing, classifying and coding combined in a single test.

12. Agility (1-2 mins.). Time taken to transfer metal rings from two upright pegs to two others 20 to 30 ft. away.

IV. *Standard ATS battery:*

Nos. 1, 4, 10, 11 above, and:

13. Arithmetic (10 mins.). Checking of computations.

14. Spelling (5 mins.). Underlining the correct spellings from among five incorrect versions of each word.

V. *Standard Army Officer battery, given at Selection Boards:*

15. A revised and more difficult form of Matrices (20 mins.).

16. A new and more difficult form of Abstraction test (20 mins.).

17. An omnibus verbal intelligence test of conventional type (20 mins.).

The majority of candidates took certain personality tests including:

18. A group word association test.

19. A thematic apperception test.

20. Practical tests of a less standardised kind based on military situations, "leaderless group" situations, etc. (6).

Supplementary tests applied to large numbers of, but not to all, recruits:

VI. *Royal Navy*

21. Clerical test, NIIP Group Test 25 (20 mins.).

22. Reading Comprehension (16 mins.). U. S. Navy test, given to most officer candidates.

Nos. 18, 19 and 20 were also adapted for naval use.

23. Kohs Blocks (10 mins.). New version by Trist and Misselbrook.

24. Comprehension, Similarities and Vocabulary from the Wechsler-Bellevue scale.

These two were chiefly used for individual testing of psychiatric cases; they were also often applied in the Army to borderline officer candidates.

25. A special battery for Submarine Detector trainees:

- a) Omnibus intelligence test, with oral directions
- b) Choice reaction time
- c) Auditory discrimination
- d) Sense of pitch (Doppler effect).

VII. Army

No. 6 and:

26. Assembly (23 mins.). A mechanical test of the Stenquist type.

27. Signal Corps Code Aptitude test, original version (10 mins.). The U. S. Army Speed of Response test was adapted later.

28. Auditory Acuity, U. S. Group Dictation test.

29. Tests of Trade Knowledge. Information tests, simple-response type, for Instrument Mechanics, Fitters, Watchmakers, Radio Mechanics and some sixteen other trades (mostly 20-30 mins.).

VIII. ATS

Nos. 27, 28 and:

30. 'Mec' test (20 mins.). Stripping and assembling meccano models.

31. Typewriting and shorthand, standard passages.

IX. Miscellaneous

32. Translations of many of the above for use in Palestine, India, etc., and by several Allied Forces.

33. A battery of performance and verbal tests for African native recruits.

34. A battery of performance tests for Indian recruits.

DISCUSSION

Several general points call for comment. Although some of these tests are taken direct, or adapted from, American sources, it will be noted that the majority differ from American usage in demanding 'creative' rather than multiple-choice responses. Multiple-choice tests are still rare in British schools, hence it was thought that their unfamiliarity would constitute a handicap to low-grade recruits. The Army in particular had to accept—and made valuable use of—many men of mentally defective level. Test scorers had lists of all permissible responses, and frequent checks were made on their accuracy.

Testing time was severely limited, hence the shortness of most of the tests. It was not until psychological selection had won its spurs that more than one hour could be granted for testing at naval Training Establishments. The lack of alternative

versions of most of the tests was a serious drawback, attributable entirely to shortage of staff. It is gradually being remedied now. Strict precautions against leakages were enforced, but when recruits needed to be tested a second or third time their results must often have been influenced by having taken the same versions previously.

British psychologists in general, and representatives of the National Institute of Industrial Psychology in particular (12) prefer not to lay great stress on tests alone. More importance was attached to the recruits' answers to a biographical questionnaire and to information elicited in an interview by a Personnel Selection Officer who, though usually lacking in academic psychological qualifications, had been carefully trained in interviewing technique (8, 25) and in interpretation of test results, and had a considerable knowledge of civilian education and industry on the one hand, and of naval or military jobs and their requirements on the other hand.³ It was laid down that no man was to be rejected from the Navy, or from any branch of any Service solely on the grounds of test scores. Low scores were to be regarded as a noteworthy fact, along with such facts as that the man had been a plumber, or left school at 13, or evinced a strong interest in mechanical hobbies, and so forth. Judgments of personality, work record, and the recruits' own interests had to be considered together with the test findings before the PSO decided what job, or class of jobs, to recommend.

Personality Tests. It will be seen that no personality tests or questionnaires are included in the list, except those used in officer selection. Undoubtedly such tests arouse more suspicion among British recruits than American, and are particularly unsuitable for low-grade, semi-illiterate men and women. They are apt also to be unpopular among naval and military authorities. Experiments were indeed carried out in the Army on several possible screening tests including word association, Cornell Index, Short Format of the NDRC Personal Inventory, adaptations of Group Rorschach, etc. But the most successful was the Bennett-Slater (1) questionnaire and cross-out test, where the neurotic

³ It is not possible in this article to deal with the work of the Job Analysis sections of SP Department and DSP. Brief descriptions are given by Rodger (13), Tuck (17) and Mercer (7).

responses are ingeniously concealed. Neither this, nor an Interests Blank of the Strong type which also proved useful, were widely applied because of insufficient time and staff to score them. Instead PSOs were instructed to look out for unstables, possible troublemakers, men greatly lacking in "combatancy," and extreme mental defectives. Some 12 per cent of all Army intakes were referred to psychiatrists on these grounds for further interview, so that a large proportion of psychopathological cases was caught on entry. In the Navy it was found that women interviewers (of the Women's Royal Naval Service) could also pick out many of the undesirables without recourse to tests (cf. below).

Attainment Tests. Although no tests for assessing knowledge or skills acquired in training courses have been issued, requests for advice from psychologists have recently been coming in. A few attainment tests were constructed for special investigations, e.g. on teaching backward readers and on the value of instructional films. Comprehensive batteries of educational achievement tests were prepared for examining candidates for certain types of Army commissions.

TEST CONSTRUCTION AND STANDARDISATION

Calibration. Tests were standardised on representative naval, Army, ATS, or officer candidate populations. Norms were always expressed in terms of SGs—Selection Groups or Grades—corresponding to a 10:20:40:20:10 per cent distribution. The convenience of this scheme for exposition to laymen outweighed the disadvantage of its slight departure from normality.

In the Navy, scores on Tests 3 (doubled), 4, 5 and 6 were summed to yield a total score for general intelligence, known as T2. The standard deviations of these component tests were approximately equal. In the Army the SGs on Tests 1, 4, 9, 10 and 11 were summed to give a Total SG as a measure of general ability. It is noteworthy that these particular component tests were chosen on the basis of validity evidence obtained from some 2,500 men in about twenty representative Army jobs. (The grounds on which the components of the U. S. General Classification Test were chosen do not appear to have been published (27).)

Item Analysis. Whenever possible, item validities

were determined. Thus in preparing revisions of Bennett Mechanical (No. 4), some 500 recruits answered 120 items, and after training in various Army mechanical jobs were graded by instructors into above and below average mechanics, and the item passes were found for each group. Tetrachoric r 's against this criterion were thus obtained, also partial r 's with general intelligence and education held constant, and two parallel 48-item tests were made up from items which added most to the g and educational tests in the selection of successful mechanics. More often, however, an internal consistency criterion was employed.

Several techniques for calculating validities and consistencies of items were tried out. The quickest was to tabulate Passes on each item in the top, middle and bottom thirds on the criterion (or on the test as a whole), and then to read off chi-squared or r_t from graphs. Biserial r between the criterion scores of testees who passed or failed each item, although apparently the popular technique in America, was discarded since it frequently yielded coefficients greater than 1.0 when the distributions of criterion scores were non-normal. Correlation ratios (obtained from the ratios of variances Between Passes and Fails to Total Variance) were preferred, but are insufficiently comparable at different difficulty levels. It was found that the simple difference between the mean criterion scores of Passes and Fails on each item (which is of course a function of correlation ratio) is less affected by item difficulty. By graphing difficulty sigma scores against these differences, the most suitable items can readily be seen.

True item difficulties can only be determined from percentages of Passes if the experimental form of the test has been given with unlimited time. This may be impracticable, and some testees may omit or fail to reach certain items. Under such circumstances it was found that a very close approximation to the *relative* order of difficulty can be obtained from the mean of:

$$\frac{100 \times \text{Passes}}{\text{No. of testees}} \text{ and } \frac{100 \times \text{Passes}}{\text{No. attempting item}}$$

Reliabilities. Specimen repeat reliability coefficients are quoted in Table 1 for large samples in each Service retested after various intervals. Naval coefficients are lower, probably not so much because

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of the longer interval as because the recruits were superior in quality at that time (only 3½ per cent instead of 30 per cent falling in Grades IV and V). The Army sample was specially built up to be representative. In each investigation the first tests were applied at several different Primary Training Centres or Reception Depots by different testers. Had the tests been given twice by the same testers at the same place, the coefficients might well have been higher. It will be seen that the paper and pencil tests yield fairly satisfactory reliabilities, except for Bennett Mechanical among women. The practical-mechanical tests (26 and 29) and Morse

tests and their organisation in different populations; b) to analyse the content of new tests in terms of factors defined by established ones;

c) to simplify questionnaires or rating scales on interests and personality traits by factorial item-analysis;

d) to explore unfamiliar abilities such as Radar operating, Anti-Aircraft work, athletic, scientific, etc., and in particular the structure of mechanical ability;

e) to analyse follow-up or validator criteria, in order to show whether several sets of marks or assessments could reasonably be regarded as measuring a single general type of proficiency, or two or more relatively distinct types.

Burt's simple summation or Thurstone's centroid method was always applied as a first step, in order to indicate what statistically significant general and bipolar factors were present. But some form of general + group factor analysis was generally preferred to rotation of axes in eliminating negative loadings (22). The outstanding finding was the prominence of the general factor in representative adult populations. Although most if not all Admiralty and War Office psychologists began their work with a somewhat dubious or suspicious attitude toward Spearman's views, the trend of our results pointed inescapably to a g + group factor theory as preferable to 'simple structure.' In seven typical analyses the g factor obtained 2½ times the variance of all other factors combined, and the most representative study, whose results appear in Table 2, yielded a g covering 52.5 per cent of variance, spatial-mechanical group factor 8.7 per cent, educational and verbal group factors 15.3 per cent. It is noteworthy that American naval psychologists also, in factorising the test scores of a heterogeneous Navy population concluded in favor of a general factor with a variance of over 30 per cent, and mechanical, spatial and educational group factors (26). But as soon as we took selected populations such as officers or mechanical trainees, correlations between some of the spatial-mechanical and verbal tests sunk to zero or slightly negative values; that is, the g which is common to these two main types of test tended to disappear, and independent factors akin to those which Thurstone obtains in selected college and high school populations provided a more satisfactory picture.

TABLE 1
Reliability Coefficients

No. of Testees.....	NAVY 500	ARMY 500	ATS 1,000
	6-8 mths.	6-8 wks.	4 wks.
1. Matrix.....	.789	.883	.866
3. Abstraction.....	.804		
4. Bennett.....	.786	.852	.707
5. Arithmetic.....	.893		
6. Squares.....	.815	.847	.878
T2.....	.907		
9. Arithmetic.....		.954	
10. Verbal.....		.972	.963
11. Instructions.....		.919	.932
12. Agility.....		.581	
13. Arithmetic.....			.886
14. Spelling.....			.912
26. Assembly.....		.759	
27. Morse Aptitude.....		.727	
28. Auditory Acuity.....		.361	
29. 'Mec' test.....			.766

Aptitude are somewhat low, and the Agility and Auditory Acuity tests definitely inadequate, in reliability.

Split-half reliability technique was scarcely ever employed, being inapplicable to timed tests (16). The Kuder-Richardson Formula #20 was generally used in the development of new tests, in preference to #21 (5).

FACTOR ANALYSIS

Some sixty factor analyses were carried out, the mean number of tests being close to 11 and the mean size of population 300. The main uses were:

a) to study the abilities measured by the standard

The second main finding was the ubiquity of the contrast between verbal, arithmetical and educational abilities on the one hand, and spatial, practical and mechanical abilities on the other hand. The same general pattern occurred among all types of male recruits, including African natives, and applied not merely to psychological tests but also to proficiency assessments. For example, ability at theory is set off from ability at Morse in naval, Army and ATS signallers and telegraphists; informational attainments contrast with typewriting and stenography among clerks, technical acquirements with

was so prominent in all tests and jobs, that the vocational psychologist was generally able to make very successful predictions of performance in any kind of theory or bookwork training by means of mathematical and verbal tests.

In contrast the k:m pole is so heterogeneous and amorphous that it would seem to be not so much a positive practical ability as a complex of those abilities which are not linguistic and not usually affected by schooling. Not only mechanical-comprehension, mechanical-information and assembly tests, but spatial judgment tests, performance tests (e.g.

TABLE 2
Factorial Analysis of Group Tests in a Representative Army Population of 1,000 Recruits

	UNROTATED SIMPLE SUMMATION ANALYSIS				GROUP FACTOR ANALYSIS					COMMUNALITIES		
	I	II	III	IV	g	k:m	ed.	v	n	Summation	Group Factor	
	Est.	Obt.			Est.	Obt.				Est.	Obt.	
1. Matrix.....	.77	+.23	+.10	-.16	.79	.17				.675	.682	.654
Dominoes (non-verbal g test).....	.80	+.09	+.19	-.12	.87					.695	.697	.752
Group Test 70 Pt. I (ditto).....	.74	+.16	+.03	-.08	.78	.13				.580	.577	.621
6. Squares.....	.63	+.35	-.00	+.01	.59	.44				.525	.523	.541
26. Assembly.....	.37	+.54	-.15	+.28	.24	.89				.515	.523	.850
4. Bennett.....	.69	+.33	-.17	+.07	.66	.31				.625	.617	.540
10. Verbal.....	.88	-.24	-.26	-.14	.79		.29	.45		.920	.919	.904
Dictation Test.....	.79	-.42	-.25	-.11	.62		.54	.48		.880	.876	.896
14. ATS Spelling.....	.81	-.32	-.20	-.11	.68		.41	.43		.800	.799	.818
11. Instructions.....	.89	-.06	+.11	-.15	.87		.23	.09		.820	.820	.819
9. Arith. Pt. I.....	.84	-.29	+.22	+.23	.72		.49		.39	.885	.889	.914
Arith. Pt. II.....	.86	-.16	+.12	+.13	.80		.38		.16	.800	.797	.815
13. ATS Arith.....	.84	-.21	+.26	+.14	.77		.36		.32	.845	.840	.817
Variance per cent.....					52.5	8.7	8.4	6.9		73.5	76.5	

personality qualities among officers, and so on. When suitable batteries of tests are analysed these "v:ed" and "k:m" types subdivide into innumerable more specialised group factors, although such sub-types do possess something in common over and above g. Thus in Table 2 the v:ed tests are best represented by a common educational factor and independent verbal and numerical sub-factors. A clerical group factor, and a subdivision of educational tests into primary vs. secondary school, or into rote vs. reasoning, types, were also often discovered. But in representative populations these sub-factors carried very low variance, whereas the v:ed factor

Kohs Block), some non-verbal g tests (e.g. Matrix), physical tests and manual dexterity tests all have something in common, beyond g, but readily break down into largely independent sub-types. The practical group factors in proficiency assessments are also relatively independent, hence vocational predictions are much less accurate in this field. An experiment in which the same tests were applied to groups of recruits at different stages of training showed that the structure of mechanical ability alters markedly with training. The Bennett test, for example, appears to test mechanical comprehension in beginners, but to become an educational

attainment test among highly trained artificers. In another study of 27 sets of marks objectively awarded to Electrical Mechanics during their six months workshop training, it was concluded that, while a general ability at all mechanical jobs does exist, distinct from g , it is of small variance, and group factors specific to the particular type of operation (fitting, turning, milling, etc.) are more prominent. Each test job, occupying the trainees several days, may be aptly compared to a single mathematical test item, in reliability and in overlapping with other jobs or items. Hence a very extensive sampling of jobs over months may be needed to yield a reliable criterion of mechanical ability.

Owing to restrictions in the application of specialised tests, little data was collected on factors other than g , v : d and k : m . A prominent physical factor was, however, found among athletic performances, age and medical category (partially overlapping with k : m). Among nine sensory-motor tests for the selection of anti-aircraft personnel, specificity was so great that common factors only accounted for 12 per cent of variance, g for 4 per cent, and the sensory-motor factors showed no relation to job proficiency. Trials of manual dexterity tests among mechanics gave similar results. Two entirely different efficiency rating questionnaires, employed in the Army and the ATS, yielded closely parallel common factors which were identified as:

- 1) keenness, smartness, conformity to discipline
- 2) social qualities
- 3) stability and thoroughness
- 4) ability at the job.

An analysis of 39 items in a biographical questionnaire, applied to one thousand naval recruits, gave:

- 1) a general cultural level factor
- 2) tendency to fill in many or few items—an additional general factor
- 3) mechanical interests and experience group factor
- 4) athletic interests group factor
- 5) domestic interests group factor
- 6) social interests group factor.

Over half the variance, however, of the average item was found to consist of specificity and unreliability.

A defect of such analyses is that the correlations were usually tetrachorics. Recently Slater has developed a technique for factorisation of chi-squareds, which should be more accurate.

VALIDATION

It is the boast of British vocational psychologists that they know more about the validity of their tests or other selection techniques than do doctors or teachers or any of the innumerable organisations which conduct scholastic, professional or trade examinations. During four years in the Navy, for example, there were 76 follow-up investigations, covering over 31,000 recruits, in which some criterion of proficiency was correlated usually with six or more selection tests, often with other data such as source or mode of entry, age, education and civilian occupation, sometimes also with numerous items such as interests or leadership experience, taken from the recruits' biographical questionnaires. These studies, the naval branches concerned, and numbers involved are shown in Table 3. The median size of sample is 300. In all of these the tests were given, or other data collected, on entry and the recruits' success or failure traced later, usually at the end of training. Validatory trials of new tests are not included.

Researches in the Army, while equally numerous, were more scattered, so that a similar complete list is not available. Soon after the introduction of regular selection procedure, 2,500 recruits in representative jobs were followed up. Thereafter many investigations were made of jobs where specific information was needed, e.g. in order to establish appropriate test standards. In the main ATS follow-up, some 6,000 auxiliaries were studied in the 27 commonest jobs, the median size of sample being 106.

It is obviously impossible to summarise all these data. An account has been given elsewhere of the abnormal distributions and the correlation techniques applied to them, the unreliability of the criteria of efficiency, methods of dealing with squad or class variations, the effects of selectivity and the difficulties in using multiple correlation and correction for multivariate selectivity (22). The value of a single composite test score, namely T_2 , is well illustrated by Table 4, which shows the 90th, 50th and 10th percentile scores for men employed in 36 representative naval branches.⁴ Clearly there is excellent differentiation between the more and less

⁴ Almost all of these figures were obtained from groups of conscripts in 1943. Standards have often changed since then and are very different in the permanent Navy.

highly skilled jobs. Table 5 shows the 90th, 50th and 10th percentile raw validity coefficients for the

TABLE 3
Follow-up Investigations in the Royal Navy

NAVAL BRANCHES	SIZE OF SAMPLE STUDIED	NO. OF STUDIES
Third Class Gunnery Rates.....	3,000+	1
Radar Operators.....	1,200+	1
Higher Gunnery Rates, Ordinary Seamen and Stokers.....	1,000+	3
Artificer Apprentices, Radio Mechanics, University Naval Divisions, Wiremen (Landing Craft).....	800+	4
Air Mechanics, Motor Mechanics, Ordinary Seamen, RNVR Officers, Wiremen (Electrical).....	600+	5
Air Artificers, Air Fitter Candidates, Coders, Electrical Mechanics, Engine Room Mechanics, Leading Seamen, Ordinary Seamen, Radar Operators, RNVR Officers, Safety Equipment Ratings, Seamen Torpedomen, Supply Assistants.....	400+	14
Air Mechanics, Asdic Operators, Cinema Projectionists, Diesel Stokers, Leading Stokers, Ordinary Seamen, Ordinary Telegraphists, Radio Mechanics, Stores Assistants, Wiremen (Landing Craft).....	300+	10
Air Fitters, Asdic Operators, Electrical Artificers, Electrical Mechanics, Engine Room Mechanics (Motor Vehicle), Ordinary Telegraphists, Ordnance Mechanics, Radar Operators, Radio Mechanics, Wiremen (Electrical), Writers.....	200+	13
Asdic Operators, Coastal Forces Ratings, Cooks, Electrical Mechanics, Fleet Air Arm Pilots, Higher Asdic Operators, Instructors, Ordinary Signalmen, Photographers, Stewards, Telegraphist Air Gunners, WRNS Personnel Selection Staff.....	150+	14
Electrical Mechanics, Engine Room Mechanics, Mechanicians, Radar Operators.....	100+	5
Fleet Air Arm Observers, Radio Mechanics, Wiremen (Landing Craft).....	50+	3
Electrical Artificers, Leading Torpedomen, Wiremen (Minesweepers).....	<50	3
		76

most frequently used tests in all naval investigations, and Table 6 the corresponding figures in ATS investigations corrected for selectivity (the uncor-

rected multiple r 's in the two Services are almost identical in median and range).

The general level of validity of these group tests is higher than might have been anticipated from pre-war experience, though obviously too low for accurate selection in the absence of other information. The highest coefficients tend to occur with jobs involving lengthy training, including a fair amount of theoretical work, when the final assessment of proficiency is based on thorough examinations, and when there is no psychological selection scheme already in operation. Still higher ones would doubtless have been found had the Services made any use of objective attainment tests. The lowest coefficients occur with jobs where the work is highly specialised (such as Radio Mechanics), or where previous trade experience is of paramount importance, also in jobs (such as Seaman) where assessments of efficiency are based more on personality qualities, e.g. dependability, than on any definite skills or knowledge.

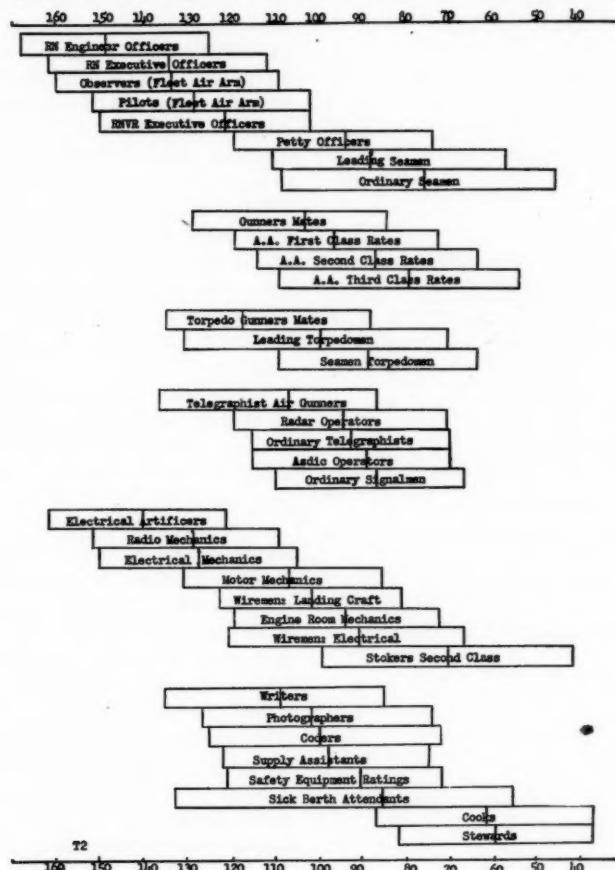
Since almost all the samples followed up had been selected by psychological procedures, the results are inevitably distorted by selectivity. Moreover statistical corrections for such selectivity are inadequate, since it does not merely involve reductions in the variance of test scores. Often, for example, PSOs might allocate to a certain branch men with low test scores but with compensating qualities of keenness or relevant experience, and when these men did well they reduced the corrected correlations between the test and the criterion. In some branches, successive validatory investigations gave poorer results as selection became more efficient. Table 7 illustrates this trend in a new mechanics branch of the Navy. The first 300 men sent for training were almost unselected, since little was known about the job requirements, and the validity coefficients of all tests are remarkably high. Among the next 300, more information was available to the PSOs; also the content of the training course altered. As the Training School got used to the better quality of well-selected trainees, the course was stiffened, and the validity coefficients among the third group of 500 are quite low.

In general the most striking result of follow-up investigations was the uniformity of the relative validities of different tests in all jobs. Table 8 shows, indeed, that the mechanical-spatial tests

were relatively less useful than verbal-numerical ones in Clerical and Communications jobs, but also that they were just about as useful among officers, seamen and gunnery ratings as among mechanics. In some branches, all the tests might achieve high

practical efficiency, but was not outstandingly successful in mechanical branches, where the trainees possessed very diverse trade experience. Just the same was found in the Army with the Bennett and with the still more mechanical As-

TABLE 4
Ninetieth, Fiftieth and Tenth Percentile T2 Scores of Men Employed in Different Branches of the Navy



coefficients, in other branches all low, but almost always the Mathematics test obtained the highest relative validity, and the Spatial test the lowest. Often in fact the Mathematics test got better coefficients than T2—the sum of four tests. The Bennett Mechanical test gave useful predictions of

assembly test. Although the Bennett is not generally appropriate for women (cf. Tables 1 and 6) yet, together with a Meccano Assembly test, it actually showed greater differential value in the ATS than in the men's Services, presumably owing to the smaller influence among women of previous ex-

perience. The conclusion followed, then, that almost all branches wanted the same type of man, one with good education (especially in mathematics) as well as good intelligence. Thus selection became largely a matter of apportioning the available supplies of high quality men among the branches according to their needs; differentiation between jobs was

TABLE 5
Raw Validity Coefficients of Standard Naval Selection Tests

TEST	1 MATRIX	3 SHIPLEY	4 BEN- NETT	5 MATHS.	6 SQUARES	T2	MULTIPLE r (UN- CORR.)
90%ile	.45	.49	.44	.57	.38	.57	.70
50%ile	.28	.30	.28	.35	.22	.40	.47
10%ile	.10	.11	.13	.17	.05	.20	.32

TABLE 6
*Validity Coefficients of Standard ATS Selection Tests Corrected
for Multivariate Selectivity*

TEST	1 MATRIX	4 BEN- NETT	13 ARITH.	6 SQUARES	11 CLERICAL	MULTIPLE r	
						Un- corr.	Corr.
90%ile	.65	.41	.69	.51	.66	.69	.84
50%ile	.49	.30	.51	.40	.56	.47	.65
10%ile	.27	.19	.26	.20	.35	.35	.50

TABLE 7
*Correlations Between Tests and Proficiency Among 1,100
Mechanics*

TEST	FIRST 300	NEXT 300	NEXT 500
1. Matrix . . . .	.623	.399	.255
3. Abstraction . . . .	.465	.568	.294
4. Bennett . . . .	.527	.352	.329
5a. Arithmetic . . . .	.553	.379	.164
5b. Mathematics . . . .	.638	.426	.369
6. Squares . . . .	.377	.282	.276
T2 . . . .	.685	.532	.375

based more on interests and interview judgments than on tests.

In the Army the Clerical or Instructions test (whose only difference from an ordinary clerical test battery is that all the operations have to be done in rapid rotation instead of in separate "slabs," hence its instructions are rather elaborate) vied with Arithmetic for top place in most branches, followed

by the Verbal test and Bennett. Clerical was outstanding, for example, among drivers and in officer selection. In the ATS the same test did best, followed by Arithmetic and Spelling.

Several factors may be involved in this result. First we have seen that tests like Clerical and Arithmetic are more reliable than, and have as high g-content as, say, Matrix. Secondly most of the validation criteria consisted of training results rather than assessments of operational efficiency, and tests with educational content might be expected to be the most successful in selecting men who could be trained rapidly. Numerous attempts were made to carry out operational follow-up, none entirely adequate. But the following experiments are worth citing.

A correlation of .624 between T2 and assessments of efficiency during fighting in Italy was obtained among 200 Royal Marine signallers, but the group tests were, in this instance, not applied until after the unit returned to Britain. Table 9 shows the numbers of good and less good men in each T2 Grade.

For the four component tests the coefficients were all between .46 and .49. Thus Arithmetic appears to retain good predictive value, but the spatial test improves, when compared with an operational criterion.

Some seven thousand men in all Arms of the British Liberation Army were assessed for efficiency at the conclusion of hostilities in Germany, and the test scores which certain groups had obtained on recruitment were traced. Among 260 infantry, the Arithmetic test gave a correlation of .263, and all other tests smaller coefficients. While this figure is low it compares favorably with the correlation of .297 between the operational assessments and efficiency gradings given shortly before the invasion.

In the ATS over 600 trainees for Anti-Aircraft duties were followed up, and later some 1,300 were assessed for efficiency after serving two or more years. The mean (corrected) validity coefficients are shown in Table 10. Most of the tests, and multiple r, drop considerably in validity at the operational stage. But Spelling achieves a much higher coefficient, and the Clerical test is relatively more valid than at the training stage.

Another approach was to contrast the test scores of men promoted to higher naval rates with lower

rates, on the assumption that the Navy would select the most efficient rather than the most educable for promotion. Correlation ratios for four tests and for T2 are shown in Table 11 among Gunnery and Torpedo rates. Though the absolute coefficients are higher in the Torpedo branch, the relative order of validities is identical, and the Mathematics test far surpasses the rest, including T2.

All the above evidence would seem to show, then, that the high validity of the v:ed tests is not primarily due to the use of training results as validating criteria. A third consideration is that, as already mentioned, shortage of personnel, time and materials prohibited the use of specialised tests which might have had greater differential value. Actually many such tests were tried out and were found to add so little to the multiple r's obtained with the standard group tests alone, that they were not pursued.

correlations, included No. 22 Reading Comprehension (naval officers, writers and stores assistants), No. 25d Doppler effect—a phonograph record based on Asdic sounds (Asdic operators), a scale and graph reading test (Radar operators), No. 8 Electrical Information (radio and electrical mechanics and wiremen), and occupational tests such as Nos. 29 and 31.

As none of these reasons appears adequate, the writer is inclined to attribute the success of such tests as Mathematics and Clerical first to the extreme heterogeneity of recruits in g and v:ed (as shown by factor analysis), and secondly to these tests involving certain personality qualities such as stability and persistence, in addition to cognitive abilities.

A few illustrations only will be given of the validation of selection techniques other than tests.

TABLE 8
Mean Validity Coefficients of Selection Tests in Clerical, Mechanical, and Other Naval Branches

NAVAL BRANCHES	NO. OF INVESTIGATIONS	1 MATRIX	3 SHIPLEY	4 BENNETT	5 ARITH.	6 SQUARES	T2
Writers, Supply, Signalmen, Telegraphists	5	.37	.38	.19	.44	.18	.42
Elec. Mechanics, Air Fitters & Mechanics, Engine Room & Motor Mechanics, Artificers, Stokers.....	18	.30	.27	.33	.38	.26	.41
Seamen, Officers, Gunnery Ratings, Leading Seamen.....	11	.31	.36	.33	.37	.24	.42

This occurred with the battery of sensory-motor tests for Anti-Aircraft personnel, with the old Morse Aptitude test for signallers, with Chleuse-

Questionnaire information, particularly data about work record and experience of leadership, were proved significant in many jobs. Thus among 274

TABLE 9
T2 SGs of Signallers Obtaining High or Low Assessments for Operational Efficiency

ASSESSMENT	T2 GRADES				TOTAL
	A	B	C	D or E	
Competent or better.....	43	66	46	4	159
Passable.....	1	7	12	2	22
Below Standard.....	1	1	10	7	19
	45	74	68	13	200

Radio Mechanics, the combined tests correlated only .33 with final training results, but the addition of such items as attendance at evening classes, examinations passed in Mathematics and Physics, and

TABLE 10
Mean Validities of ATS Selection Tests in Several Anti-Aircraft Jobs at Different Stages

TEST.....	1 MATRIX	4 BENNETT	13 ARITH.	6 SQUARES	11 CLERICAL	14 SPELLING	MULTIPLE r
Training Stage....	.47	.24	.53	.11	.42	.06	.65
Operational..	.35	.21	.30	.25	.37	.31	.43

bairgue's (3) discrimination reaction time test for drivers, and others. The most useful supplementary tests, which did produce significant rises in multiple

interests in metalwork, house repairs, radio and electrical repairs, and photography, raised the (uncorrected) multiple r to .56. So much reliance was placed on the interpretation by PSOs and psychologists of questionnaire and interview information that the validity of their judgments received considerable attention. Among 460 Safety Equipment ratings, an experienced PSO graded each man from his questionnaire only, not knowing his test scores, and achieved a correlation of .55 with training results, whereas T2 gave a correlation of only .39. But it was also found that PSOs varied rather widely in ability. Thus when 1,631 Radio and Electrical Mechanics and Wiremen who had been selected by 13 different PSOs were followed up, the failure rates on course of men selected by different PSOs ranged from 18 per cent to 37 per cent, the median being 24 per cent. Similar variations were traced among Army PSOs both in the proportions of suitable

cruiting Centres, can pick out a large proportion of suspect cases was shown in an experiment where four Wrens interviewed 147 actual psychiatric cases (in or out patients) mixed with 175 controls. From perusal of the men's questionnaires and from a few simple questions about 'nerves,' dieting, etc., they picked 54 per cent of the psychiatric cases and 16 per cent of the controls as suspect. Moreover it was discovered later that, of the 16 per cent controls, most of whom were seen by a psychiatrist, over half did actually possess some considerable degree of abnormality.

The value of selection procedure as a whole was best shown in the Fleet Air Arm, where over 16,000

TABLE 11
Correlation Ratios for Naval Selection Tests

NAVAL RATES	NOS.	3 SHIPLEY	4 BENNETT	5 MATHS.	6 SQUA- RES	T2
Four A.A. Gun- nery rates.....	1,336	.14	.27	.38	.15	.31
Three Torpedo rates.....	264	.31	.45	.58	.39	.53

recruits which they selected as potential officers, and in the failure rates of their selectees at W. O. Selection Boards.

A psychologist's interview gradings of 503 naval officer candidates were compared with the gradings of an Admiralty Selection Board. When the selectees were followed up to the end of their training, it was found that 71.0 per cent of those given favorable grades by the psychologist had passed, and 61.4 per cent of those favorably graded by the Board. It should be noted that both the psychologist and the Board knew the candidates' T2's, but the psychologist did not see the reports, prepared for the Board, on the candidates' previous record in the Navy. Had selection been based on a certain T2 pass-mark alone, 66.3 per cent of those above this mark would have successfully completed their training.

That Wren Petty Officers, interviewing at Re-

TABLE 12
Failure Rates of Fleet Air Arm Mechanics and Fitters Selected by Different Methods

CATEGORY	OLD METHOD		PSYCHOLOGICAL METHOD		
	No. of men put on course	% failed	No. of men put on course	% failed	
Air Me- chanics	Airframes	1,333	16.8	2,234	6.9
	Engines	1,219	21.2	2,218	5.6
	Ordnance	902	7.3	1,596	0.6
	Electrical	832	16.1	1,969	4.9
Air Fitters	Airframes	953	10.1	723	4.3
	Engines	890	15.6	743	5.4
	Ordnance	130	13.1	199	2.0
	Electrical	271	9.2	326	1.8
Total.....		6,530	14.7	10,008	4.7

mechanics and fitters were followed up. Over 6,000 were selected by standard methods before psychologists played any part, and their overall failure rate on course was 14.7 per cent. When selection was undertaken by PSOs, working under a psychologist, not only did the failure rate for 10,000 men drop to 4.7 per cent (cf. Table 12), but also they extracted a much larger proportion of trainees from the available recruits, without denuding other mechanical branches which were likewise making large demands at that time.

In the ATS it was possible to compare several groups of auxiliaries selected by PSOs with others, who were trained simultaneously but were selected by other methods, with the results shown in Table 13.

Several workers were continuously engaged on the follow-up of Army officers, and made important contributions to the technique of collecting reliable assessments both at OCTU (the Training Units) and in the field. Full control over the selection methods and grading standards of the different Selection Boards was never satisfactorily established, with the result that the reliability of selection was inadequate. Thus in an experiment where 116 candidates each went before two Boards, the average agreement between pairs of Boards was represented by a tetrachoric correlation of .67. Nevertheless these Boards were shown to be significantly more successful than the traditional Boards where selection was based only on testimonials and interview. Some 1,200 cadets selected contemporaneously by old or new Boards were followed up at OCTU, and selectees from 7 out of 8 new Boards obtained better

on scores was found, corresponding to a correlation ratio of .244. Age contributed 5.9 per cent, Occupation 13.4 per cent and Area 1.4 per cent to total variance. The analysis of interactions of these factors is not yet complete, but it has been found that the rate of decline with age is significantly greater in the lower occupational groups. In Table 15 which shows the mean sigma scores for occupations and areas, the age distribution is held constant; and in the means for different age groups, occupation and area distributions are held constant.

Distribution of Colour Defect. The results of the naval colour vision test for 123,000 recruits tested in 1942 showed variations between different *large* Recruiting Centres (those testing over 1,000 cases) of 3.8 per cent to 10.4 per cent in proportions of colour defectives. Analyses of variance indicated that differences due to the tester, or method of giving the test, were of doubtful significance, but that re-

TABLE 13

Failure Rates of ATS Trainees Selected by Different Methods

CATEGORY	NO. SELECTED BY OLD METHODS	% FAILED	NO. SELECTED BY FSOs	% FAILED
Drivers.....	124	30	1,004	14
Clerks.....	128	11	592	4
Special Operators.....	420	60	130	7
Operators Wireless and Line.....	217	7	187	0.5

results than those from five old Boards, in almost all Arms of the Service (cf. Table 14). In 1945, assessments of over 500 officers in Infantry and Royal Artillery were obtained from Commanding Officers just before the crossing of the Rhine, and slight but significant differences in efficiency were found between those who had been passed as A's or B's, C's and D's at their Selection Boards. Considering the disturbing effects of age, length of commissioning and other factors, and the extreme selectivity of the sample (less than 3 per cent of recruits in 1943-45 became officers), the result is fairly satisfactory.

MISCELLANEOUS RESEARCHES

Age, Occupational and Regional Differences in Intelligence. The Matrix scores of 90,000 naval recruits who fell within a dozen broad occupational groups were tabulated for all Recruiting Areas in the country. An almost linear regression of age

TABLE 14
Training Results of Army Officer Cadets Selected by Traditional
and by Psychological Methods

BOARDS	NO. SELECTED	ABOVE AVERAGE	OCTU GRADINGS, AVERAGE	BELOW AVER- AGE AND FAIL
Old.....	491	22.1%	41.3%	36.6%
New.....	721	34.5	40.3	25.2

gional differences were highly significant. When the Centres were grouped into nine major areas (24), percentages of defectives ranged from 5 or 6 in the North and East to 8 or 9 in the South and West, and there was good correspondence with the incidence of dark eye and hair colour in these areas. This finding may be due in part to a genetic linkage, or, as Burt has shown (2), to a direct effect of pigmentation on colour vision. In a supplementary investigation, data on the present-day distribution of hair and eye colour of recruits are being collected, with the aid of a new scale of plastic eyes.

Service Differences. Though entirely trustworthy comparisons are not possible, there is strong evidence that the Royal Air Force acquired the greatest, and the Army the smallest, proportions of high-grade recruits. Percentage distributions on the Matrix test (Army norms) for over 100,000 men both in the Army and the Navy, recruited during 1942, are shown in Table 16. Conversion tables were also

built up between the standard Air Force and naval test batteries, and approximate T2 percentiles are given in Table 17.

Value of Pre-Service Training. Some three thousand members of the Air Training Corps, Sea Cadet Corps, Army Cadet Force and other pre-service organisations were followed up, both in the Navy and the Army, together with large control groups of non-members. While these recruits were shown to yield large proportions of officers or of men suitable for many kinds of specialist jobs, this was attribut-

tained the proficiency Certificate A showed however that such men were much superior to controls (with no pre-service experience) in their first 3 to 4 months of training, but much less superior when judged later as officer candidates by W. O. Selection Boards. Correlations between these criteria and possession of Certificate A and the standard test battery are given in Table 19.

Effects of Attendance at Physical Development Centres and Basic Education Courses. Some 250 Army recruits with very poor physique who took a

TABLE 15
Mean Sigma Scores of Occupational, Age and Area Groups on Matrix Test

OCCUPATION	SIGMA SCORE	AGE	SIGMA SCORE	AREA	SIGMA SCORE
yrs.					
Clerks.....	+.71	16-17	+.16	London.....	+.14
Electrical Workers.....	+.34	18-19	+.10	Manchester.....	+.11
Precision Workers.....	+.17	20-24	+.01	Derby.....	+.02
Woodworkers.....	+.12	25-29	-.19	Southampton.....	-.01
Sheet Metal Workers.....	+.03	30-34	-.30	Newcastle.....	-.04
Machine Operators.....	-.08	35-39	-.46	Liverpool.....	-.06
Retail Tradesmen.....	-.12	40+	-.70	Birmingham.....	-.09
Builders.....	-.14			Bristol.....	-.16
Mates (all types).....	-.24			Glasgow.....	-.18
Drivers.....	-.31				
Farm Workers.....	-.46				
Labourers.....	-.52				

able chiefly to their superior education and intelligence. Thus in the Army, variance in recommendations as potential officers was accounted for as shown in Table 18. All of these values are statis-

2 months course at a Physical Development Centre were tested before and after; (results on the Matrix

TABLE 16
Percentage Matrix Test Distributions for Army and Navy Recruits (1942)

SG	ARMY	NAVY
I	12.3	14.5
II	23.6	27.9
III	42.5	44.1
IV	16.2	12.3
V	5.4	1.2

tically significant. In the Navy, ex-Scouts were found to do at least as well as ex-members of the Air Training and Sea Cadet Corps. A smaller experiment on Army Cadets who had worked for and ob-

TABLE 17
Approximate T2 Percentile Scores for Air Force, Navy and Army (1942 and 1945)

	DATE	PERCENTILE		
		90th	50th	10th
RAF Air Crew.....	1942	141	114	85
RAF Ground Staff.....	1942	116	81	54
Naval Recruits.....	1942	108	75	46
Naval Recruits.....	1945	132	100	68
Army Recruits.....	1942	100	72	36
Army Recruits.....	1945	112	81	48

test only were available for 648 cases). Expected retest rises were determined from the experiment on the reliability of selection tests. Obtained retest

rises gave the F-ratios shown in Table 20, when subjected to analysis of variance.

Attached to PDCs are picked educational Sergeants who organise numerous 'brains trust' periods, spelling bees and the like. This may account for the big rise on the Verbal test. The rise on Matrix may indicate increased mental as well as physical alertness, rather than an improvement in basic intelligence. There is no appreciable increase on other mental tests. The increase in Agility would be expected and conforms with an improvement in medical category, height and weight.

A similar experiment on illiterate recruits sent to

TABLE 18
Analysis of Variance in Potential Officer Recommendations Attributable to Several Factors

	SUM OF SQUARES	per cent
Differences in Educational Standard.....	19.9	
Additional variance due to membership of a pre-service organisation.....	0.9	
Additional variance between different organisations.....	3.1	

TABLE 19
Relative Predictive Value of Pre-Service Training and of Selection Tests

	PRIMARY TRAINING RESULTS	W.O. SELECTION BOARD RESULTS
Possession of Certificate A vs. no pre-service experience.....	.47	.24
Selection test battery.....	.38	.33

a 6 weeks Basic Education Course showed no change in Matrix and Arithmetic scores beyond the usual retest rises. In a Reading Comprehension Test, exactly parallel forms of which had been prepared, the improvement among men sent by their own Units was generally small and irregular. But among those selected by PSOs and psychiatrists as likely to benefit from the courses, the average improvement was much larger and highly significant.

Effects of Menstruation on Test Performance. The day within the menstrual cycle on which the standard selection tests were taken for a second time was ascertained by Medical Officers among 1,335 ATS recruits, all of whom claimed a normal or 28-day

cycle. They were classified into four 'phase' groups:

- (i) From 4 days before to 4 days after the onset of menstruation
- (ii) From 5th to 10th day
- (iii) Ovulation phase—11th to 18th day
- (iv) From 19th to 24th day

At the original testing, the menstrual days were unknown and could be assumed to be randomly distributed. Comparisons of test and retest Matrix scores yielded the analysis of variance shown in Table 21.

There appear to be slight differences between observed and expected retest scores on some days, but they are irregular and are not associated with particular menstrual phases. Phase as such has no demonstrable effect. A similar analysis of the

TABLE 20
Results of Analyses of Variance in Re-test Rises Due to Attendance at Physical Development Centres

TEST	F-RATIO	P
10. Verbal.....	67.65	<.001
1. Matrix.....	47.74	<.001
12. Agility.....	32.37	<.001
26. Assembly.....	5.10	<.05 >.01
9. Arithmetic.....	2.52	>.05
4. Bennett.....	0.71	>.05

Clerical test gave negative results, and on other selection tests phase differences were even smaller.

In a further experiment, 1,000 auxiliaries were asked to state both at test and retest if they felt unable to do themselves justice and if so on what grounds. The scores of 3.45 per cent who claimed menstrual unfitness on either occasion showed no significant differences from the remainder. Those suffering from colds showed a slight, but not significant, drop in scores. A strong association was noted between incidence of menstrual pain and type of ATS or civilian employment. It was significantly higher among women in strenuous or outdoor, than in sedentary and indoor, jobs.

Value of Film and Film-strip in Instruction. Seven groups of recruits, each including over a hundred men in 3 or 4 classes, were instructed for three periods in a branch of seamanship by various methods such as oral and practical instruction, film and/or film-strip, and were later given an ob-

jective written examination without warning. Periods between instruction and examination and instructors with different degrees of competence were systematically distributed through all groups. Analysis of covariance (which held constant class differences in intelligence) showed significant improvements, amounting to about 8 per cent in marks, due to the use of the film-strip, the addition of the film, and good vs. poor instructors. The film was the most successful in view of the much shorter time that it takes. It had more effect on questions designed to test comprehension than on questions demanding memory of details. The latter, but not the former, type of questions was significantly affected by a longer period between instruction and examination. Other uncontrolled factors such as the morale of the classes and amount of private study or coaching, which were measured by the

- 7) Use of sarcasm or abuse by instructors, unsympathetic handling
- 8) Inadequate selection of NCOs suited to instructing; lack of training in instructional technique
- 9) No homogeneous grouping of classes in ability
- 10) Haphazard and subjective examination techniques

Several reforms arose out of this enquiry and from the investigations of instructional techniques carried out by Stephenson, who was Consultant Psychologist to the Army Medical Service. Another major field of work was the application of time and motion study to gun drills and to the design of equipment (18).

In the Navy, detailed investigations were made into selection and training of Asdic operators, Radar operators and Radio Mechanics, Telegraphist Air

TABLE 21
Analysis of Variance Due to Menstrual Phases

	SUMS OF SQUARES <i>per cent</i>	D.F.	MEAN SQUARE	F	P
Total variance on retesting.....	100.00	1,334			
Accounted for by regression of retest on test.....	62.3281	1			
Accounted for by differences between phases.....	.0660	3	.2626	1.27	> .05
Accounted for by differences between days in the same phase.....	1.0558	24	.5254	1.57	<.05 >.01

residual variance between groups and classes, were shown to have only a small influence (23).

Other Training Investigations. A memorandum on methods of Army instruction was drawn up by Valentine in 1942 on the basis of replies to a questionnaire sent to past students in the Army (19, 20). The main defects mentioned were:

- 1) Mechanical, parrot-like teaching
- 2) Unnecessary enumeration of parts of weapons at early stages
- 3) Use of technical vocabulary and unfamiliar words
- 4) Too much crowding of instruction; bad organisation of courses
- 5) Lack of "learning by doing," lack of appeal to interest
- 6) Lack of visual aids and of elementary textbooks

Gunners (Fleet Air Arm), Torpedo ratings and Electrical Mechanics, and, in the Engineering Branch, Artificer Apprentices, Mechanicians and Leading Stokers. An elementary manual of psychological principles of instruction was published (21). A critical analysis of methods of learning to receive and send Morse Code, based largely on recent American researches, was also prepared.

In these specialist courses, the ability of instructors and lecturers was much less open to criticism, and attention was mainly concentrated on:

- 1) Success of trainees obtained from various sources, with varying previous experience and background
- 2) Propaganda for attracting suitable candidates
- 3) Organisation of the syllabus; working hours, distribution of periods, size of classes, etc.
- 4) Effects of conditions of work on the morale of trainees

- 5) Functions of theoretical instruction, and its integration with practical training
- 6) Use of visual aids, including diagrams, charts, films, and demonstration models
- 7) Methods of examining and marking.

In conclusion, although the volume of experiments on training methods was not large, and the psychologists' recommendations may often have carried little weight at the time, yet a very large measure of goodwill was built up, and there is now a readiness to consult psychologists in the early stages of planning instruction or of producing training devices, which would have been unthinkable five years ago.

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AN ANALYSIS OF DUTIES PERFORMED BY CLINICAL PSYCHOLOGISTS IN THE ARMY

MAX L. HUTT¹

Teachers College, Columbia University

AND

EMMETTE O. MILTON

University of Tennessee

PSYCHOLOGISTS were first commissioned in the Army as clinical psychologists in October 1944. Almost three hundred were elevated directly from enlisted ranks wherein they had served in varying capacities in almost all branches of the service. Other psychologists, previously commissioned, were transferred to the new clinical psychology program. Since commissioning they have served primarily in General and Convalescent Hospitals, Consultation Services, Rehabilitation Centers, and Disciplinary Barracks. Although numerous publications of the War Department have outlined their functions and duties, it was felt that an actual survey of the functions performed by these officers would provide material not only of historical interest but also of value in planning the future education, training, and professional activities of civilian psychologists.

Accordingly, in April 1946 a questionnaire was distributed by the Clinical Psychology Branch of the Surgeon Generals Office to psychologists *who were then on duty* in General and Convalescent Hospitals and Hospital Centers. The questionnaire was arranged in three schedules: identifying and military service data; analysis of job functions; experience with psychological tests, validation studies, therapeutic experience, and research programs. Each officer was requested to supply the necessary information, insofar as practicable, for each of five periods: Period I (Sept. 1-Dec. 1944), Period II (Jan.-Apr. 1945), Period III (May-Aug. 1945), Period IV (Sept.-Dec. 1945), Period V (Jan.-Apr. 1946). Replies were received from all of the fifty commissioned clinical psychologists on active

duty on 1 May 1946 in the types of installations mentioned above. Some additional correspondence was necessary between the Clinical Psychology Branch and eight of the respondents in order to clarify some of the data or to correct statistical inaccuracies. Several selective factors were in operation and the conclusions reached herein show trends only.

Analysis of the assignments of these fifty officers for the past eighteen months reveals that as of 1 May 1946, forty-five of the psychologists were assigned to General and Convalescent Hospitals. The contrast with the types of assignments held by these same psychologists only one and a half years ago is striking. At that time (Period I) only twelve were assigned to General and Convalescent Hospitals. The remaining thirty-eight were distributed among Regional and Station Hospitals (five), Consultation Services (two), Induction Stations and Personnel Centers (five), other psychological assignments (nonmedical) (nineteen), and non-psychological assignments (seven).

It is obvious that there was a trend toward concentration of clinical psychologists in the large medical installations which became most active in Period III (summer of 1945). This is understandable in the light of two main factors: (1) neuro-psychiatric casualties from combat areas were being concentrated in Zone of Interior installations during that period, and (2) the commissioning and training program for clinical psychologists resulted in a relatively sufficient supply of such officers by mid-summer of 1945; they could consequently be assigned where their services were needed most.

It is interesting to observe that during Period IV (fall of 1945) there were no psychologists in non-

¹ Formerly, Chief, Clinical Psychology Branch, SGO.

psychological assignments (within the limits of this survey). Another interesting commentary is that only twelve of the fifty psychologists being studied had continuous assignments in General and Convalescent Hospitals for the entire period of this study. While frequent changes of assignment, not necessarily most conducive to stability of function and maturation in skill and responsibility, was the rule, it is evident that there was steady progress in securing appropriate professional assignments.

Table 1 shows the percentage of time devoted to various job functions during each of the five pe-

explanatory, but a few of the important and outstanding trends may be emphasized and commented upon.

From an examination of Period V, it is apparent that psychologists distributed their time over a wide variety of functions. Chief among these functions was the administration and interpretation of individual psychological examinations. Analysis of later data showing the actual tests used and the material contained in the narrative statements indicates not only that this was the most important single contribution of clinical psychologists, but that this was a highly technical and specialized contribution to the functioning of the neuropsychiatric team.

The proper selection of batteries of psychological tests and their careful administration and interpretation for varied hospital populations constituted a vital service in both diagnosis and definitive treatment. This is a tremendous change from the time when psychologists were largely psychometrists interested primarily in intellectual evaluation (and thought by others to be capable only in that area). This trend is so important that further analysis and emphasis will be provided later in the paper.

Although group psychological tests were occasionally administered to hospital patients, they were rarely employed in the diagnostic evaluation of neuropsychiatric patients.

Guidance and Therapy constituted the second most important area in Period V. Detailed analysis of the data revealed that most of the time spent in this area was with individual therapy, the remainder of the time being invested in counseling and group psychotherapy. While this emphasis resulted in part from the desires of psychologists to participate in this type of work, in much larger measure it was the result of a tremendous patient load which could not be handled by neuropsychiatrists alone, and so involved clinical psychologists and psychiatric social workers as well as psychiatrists. Table 1 shows that psychologists were used increasingly to meet these emergency needs. The functions of re-education carried by psychologists with aphasic patients and with other physically handicapped patients (paraplegics and the deaf, for example) contributed to the relatively large amount of time given to guidance and therapy. In the past, there has been little or no emphasis upon this type of activity in our edu-

TABLE 1
Percentage of time given to various job functions during each of five periods† from Sept. '44 to Apr. '46

JOB FUNCTION	PERIOD	PERIOD	PERIOD	PERIOD	PERIOD
	I % OF TIME	II % OF TIME	III % OF TIME	IV % OF TIME	V % OF TIME
7*. Administration & Supervision.....	17.4	16.4	18.3	17.1	17.5
8. Ind. Psychol. Examinations.....	30.8	35.2	28.9	28.9	34.9
9. Group Psychol. Examinations.....	2.4	2.2	1.6	2.4	0.3
10. Guidance & Therapy.....	12.4	21.4	23.5	29.6	24.4
11. Liaison Functions.....	3.5	4.6	7.7	8.3	6.5
12. Army Boards.....	1.4	1.3	2.4	2.4	2.6
13. Official Research.....	2.9	2.4	0.4	0.6	1.4
14. Case Histories.....	12.0	8.1	5.2	3.9	3.0
15. Misc. Professional Duties.....	10.6	3.8	6.8	4.7	4.1
16. Non-Professional Duties.....	6.6	4.6	5.2	2.1	5.2
Total.....	100.0	100.0	100.0	100.0	100.0

* The numbers preceding the job functions are the numbers assigned to these items in the schedules.

† For explanation of "Periods" see body of this report.

riods. It should be emphasized that these figures are based on estimates and are approximations only. In some cases, the supplied figures may have been influenced by the way in which psychologists envisioned their assignments. In other instances these estimations were affected by various memory factors and by the fact that most of the time work was conducted under pressure. Since, however, these were official questionnaires and were reviewed by Chiefs of Service and Commanding Officers they may be accepted as reliable for practical purposes.

The data contained in Table 1 are largely self-

cational and training programs. The figures in this survey certainly suggest that considerably more attention needs to be directed toward this area.

It is interesting that only 3 per cent of total time was spent in obtaining case or social histories. Probably, the most important single factor accounting for this low figure was the successful attempt of the Army to assign social workers and psychiatric social workers to medical installations. Perhaps also it is the result of psychologists demonstrating their proficiency in other areas more closely related to their training. It is gratifying to note that these psychologists in Zone of Interior medical installations devoted only approximately 5.2 per cent of their time in 1946 to nonprofessional duties (Officer of the Day, Assistant Adjutant, Inspection teams, etc.). While it is known on the basis of many communications received in the Clinical Psychology Branch as well as of personal interviews that psychologists serving in overseas installations were frequently not utilized in a professional capacity, such is not the case with those reporting in this survey.

It should be emphasized that Table 1 includes the average percentages for the several items discussed. Individual variations, often marked, were noted in evaluating the original data sheets. Such variations suggest that to some extent psychologists functioned primarily in those areas in which they were most proficient.

An analysis was made of the tests employed by these clinical psychologists. The respondents in this survey personally administered individually 9,341 intelligence tests, 8,652 projective personality tests, 1,931 nonprojective personality tests, 2,530 tests for mental impairment, 256 conceptual tests, 398 tests for aphasia, and 3,515 miscellaneous tests including 2,695 administrations of a hearing attitude scale. Twenty-five specific tests were listed; the list would be even greater if the tests employed by the enlisted personnel of the clinical psychology sections were included. Furthermore, the variety of tests utilized was decreased by a number of factors: (1) in the initial phases of the program only four tests were "authorized" for use and although the number was later increased to seven, it was exceedingly difficult to obtain other (nonauthorized) tests without specific justification, local approval, and irritating delays; (2) because of war conditions

some tests were not being published and others which were available only from foreign publishers were not obtainable; (3) the pressure of work upon psychologists was so great that there was a tendency to use the least number of tests to provide answers to the largest number of questions. The wide variety of tests actually employed indicates, among other things, that the problems being faced were many and varied, that psychologists with differing backgrounds favored different instruments and that there was good, critical judgment employed in deciding upon appropriate tests and test batteries.

As previously indicated, intelligence tests were utilized most frequently although projective personality tests were administered almost as frequently. Further inspection of the data revealed that the purposes for which intelligence tests were administered have changed since World War I. The psychologist is interested in determining more than the present level of intellectual functioning. The tests are used almost as often for "differential diagnosis," which is based upon scatter analysis, qualitative evaluation of the content of responses, evaluation of modes of intellectual functioning, and an evaluation of specific mental abilities and disabilities.

Personality tests have emerged in clinical psychology in World War II to a most prominent place; the reporting officers administered 10,583 of them. These tests continue to be most useful in differential diagnosis, serving as a primary adjunct to modern psychiatric techniques in diagnosis and therapy. In a large number of instances an evaluation of the psychodynamics of the personality under examination was a primary objective. In other instances, the tests were scrutinized for significant cues for therapy. According to the number of times administered, the projective personality tests had the widest applicability. The Rorschach Psychodiagnostic was administered 4,372 times, the Bender Gestalt was administered to 2,954 patients, and the Murray Thematic Apperception Test was utilized with 928 cases. The Minnesota Multiphasic Inventory was also used widely but was found less suited to individual clinical examination than to the problem of mass screening of psychoneurotic soldiers. Other personality tests were employed far less frequently than the four which have been mentioned. This is another area in which education and training are meager in the development of future psycholo-

TABLE 2

*A list of research projects of clinical psychologists.
Unofficial Research and Publications (completed)*

The Use of Certain Psychological Tests in the Detection of Brain Injury; Aita, J. A., Armitage, S. G., and Reitan, R. M.

A Critical Evaluation of Certain Psychological Measures, Including a Proposed Screening Test, Used for the Determination and Evaluation of Brain Injury; Armitage, S. G. and Reitan, R. M.

Wepman Organic Survey; Wepman Joseph: *Journal of Speech Disorders*, 10: 283-286.

Rorschach and Psychometric Findings in Selected Cases of Soldiers with Traumatic Head Injuries; Schoenberg, G. M.

Tachistoscopic Studies on Brain Injured Cases; Dubin, S. S.

The Shipley Hartford Scale in 100 Selected Cases; Brown, Robert J.

The Wechsler-Bellevue Intelligence Scale as a Diagnostic Psychological Technique; Fisher J.

Group Psychotherapy for Neuropsychiatric Patients Being Discharged from the Army; Michaels, J. J. and Milton, E. O.; *Occupational Medicine*. January 1946, 1: 60-74.

Comparison of Independent Judgments of Psychiatrists and Interpretation of Test Batteries by Psychologists in 50 Cases of Disputed Differential Diagnosis; Schwartz, Bert D.

Contemplated Research (In Process)

Laboratory Study on the Problem of Anxiety.

A Study of Wechsler-Bellevue Scatter Patterns as Diagnostic Aids.

A Study of the Relationships between Full Scale and Verbal Scale Wechsler-Bellevue I.Q.

A Study of the Effectiveness of the Harrower-Erickson Multiple Choice Rorschach in Screening Psychoneurotic Patients.

Visual Aids in Therapy.

Tests and Therapy for Aphasics.

Psychological Studies in Patients with Traumatic Injury to the Head Correlated with Neurological and Neurosurgical Studies.

The Utilization of Group Psychotherapy in an Authoritative Setting.

A Group Thematic Apperception Test for Screening Purposes.

The Extent and Effectiveness of Treatment by Electric Shock and Insulin on Psychotic Patients as indicated on Psychological Tests.

The Neurotic and Psychotic Concept of Body Image as Measured by Drawings of a Man and Woman.

The Nature and Progress of Therapeutic Education with Aphasics.

The Area of Aphasic Re-education.

The Adjustment Pattern of the Hard of Hearing Individual.

Investigation of Parent-Child Relationships (especially in cases of extreme parental dominance) with the Rorschach and the Murray Thematic Apperception Test.

The Relationship Between Morale and Nervous Disorders.

The Personality Structure of Patients with Peptic Ulcer.

The Civilian Adjustment of 1000 Neuropsychiatric Casualties.

gists. It is obvious that these tests can be as helpful in civilian practice as they were in Army practice.

Tests of conceptual thinking were found particularly useful in cases suspected of psychosis and/or organic brain damage. Much additional research is still needed to determine the best methods of measuring conceptual thinking and its relation to psychiatric and organic brain disorders. In the area of impairment, the narrative statements revealed that existing tests were not adequate and several mentioned that the Shipley-Hartford Scale was the least useful. It is felt that outstanding opportunities for research in this area were overlooked during the war.

The data on specific tests indicate further that several batteries of tests were developed for the examination of patients with aphasia. Little knowledge was available concerning this disorder at the beginning of the war, partly because it was a rare occurrence. Although there were some discussions available in the literature, there was little of a practical nature, either in diagnosis or therapy. In 1945 the psychological diagnosis and re-education of aphasic patients were made the responsibility of clinical psychologists. In the course of this experience, existing aphasia examinations were revised and in most instances combinations of tests were developed. The data revealed further that other types of tests were applied in this area. The patient was examined as a whole, his total assets and liabilities evaluated, and an appropriate program of rehabilitation and re-education outlined. A number of important advances in diagnosis and treatment were made. Some of these contributions were incorporated in a War Department publication (TB MED BULL 155, April 1945); others were incorporated in tests developed by Captain Jon Eisenson (published by the Psychological Corporation); additional tests and training procedures were developed by Second Lieutenant Joseph Wepman and by Captain Louis Granich.

Inspection of the narrative statements indicated that despite numerous limitations psychologists conducted some research. Some of this research was concerned with the continual validation of the psychological tests already being utilized. This was done by intratest comparisons, informal validation against external behavior criteria, comparison with psychiatric diagnoses, comparison with symptomatic difficulties, and validation against therapeutic outcome. Table 2 lists the studies that were

reported. This list is incomplete, for a number of discursive articles which have been published by clinical psychologists are not included. Table 2 may, therefore, be interpreted as a conservative statement of "current" research activities of the fifty respondents.

SUMMARY AND CONCLUSIONS

1. Clinical psychologists have been devoting an increasingly larger proportion of their time in the Army to professional responsibilities.

2. Psychologists devoted more than half of their time to two major activities: (1) individual psychological examinations, and (2) guidance and therapy.

3. The Army clinical psychologist is infrequently called upon to give routine tests for evaluation of intellectual level. Personality examination, including an evaluation of the patient's psychodynamics, is now the most frequent reason for referral; even intelligence tests are used in dynamic interpretations of personality structure and personality process.

4. The results of this survey are suggestive with respect to training needs of clinical psychologists who are called upon to work with neuropsychiatric patients. Three main changes in emphasis are indicated: (a) careful attention should be given to training in personality testing and evaluation, with special stress upon projective techniques and methods of evaluating patient psychodynamics; (b) there is a clear need of intensive supervised training in counseling and therapy for which adequate clinical facilities, as part of the training program, are indispensable; (c) clinical work without correlated opportunity for clinical research is stultifying; hence, training is needed in the specific problems of clinical psychology.

5. In terms of diversity of function despite numerous handicaps, the results of this survey suggest that the commissioning program for psychologists was successful. Furthermore, those participating in the program gained experiences which will be invaluable to them in attempting to solve the problems with which all social scientists must cope.

THE PLACE OF EXPERIMENTAL PSYCHOLOGY IN THE UNDERGRADUATE CURRICULUM

ANNE ANASTASI

New York City

AT A time when most college faculties are engaged in a re-evaluation of post-war curricula, it should be of interest to psychologists to consider the practices and opinions of some of their colleagues concerning the teaching of certain basic courses in the field. The present study is directed toward one such course, the laboratory course in experimental psychology as taught in the undergraduate curriculum. This is a preliminary and informal study which, it is hoped, will stimulate further discussion, both of this course and of other basic courses in psychology.

In the attempt to clarify the place of experimental psychology in the undergraduate curriculum, two approaches have been employed. First, 75 college catalogues were examined for information regarding existing practices in leading colleges. Secondly, a mail inquiry among 56 outstanding psychologists furnished an indication of what is considered desirable practice, as well as of the direction of development in the undergraduate teaching of experimental psychology.

PART I: THE CATALOGUE SURVEY

The data for the present part of the survey were obtained from the catalogues of the following 75 colleges¹ distributed in 36 states:

U. of Alabama	U. of Chicago
Barnard	U. of Cincinnati
U. of Buffalo	U. of Colorado
Brigham Young	Columbia
Brooklyn	U. of Connecticut
Brown	Cornell
Bryn Mawr	Dartmouth
U. of California, Berkeley	Duke
U. of California, L. A.	Fordham
U. of Southern California	U. of Georgia
Catholic U. of America	George Washington

Goucher	Pennsylvania State
Harvard	U. of Pennsylvania
Hunter	U. of Pittsburgh
U. of Illinois	Princeton
U. of Iowa	Purdue
Indiana	U. of Rochester
Johns Hopkins	Skidmore
U. of Kentucky	Smith
U. of Louisiana	Stanford
U. of Maryland	Swarthmore
Miami (Ohio)	U. of Syracuse
U. of Michigan	U. of Tennessee
U. of Minnesota	U. of Texas
U. of Mississippi	Tufts
U. of Missouri	Tulane
Mount Holyoke	Vassar
U. of Nebraska	Vanderbilt
U. of New Mexico	U. of Vermont
College of the City of N. Y.	U. of Virginia
New York University	U. of Washington (Seattle)
U. of North Carolina	Wellesley
Northwestern	U. of West Virginia
Oberlin	Western Reserve
Ohio State University	William and Mary
U. of Oklahoma	U. of Wisconsin
Oregon State	Yale
U. of Oregon	

Since it was the aim of this survey to contribute toward a clarification of the most effective direction in which the teaching of undergraduate experimental psychology can develop, mere statistical "nose counting" would not have answered the question. A survey of existing practice in a random sample of all American colleges would undoubtedly have been overloaded with small colleges. In such colleges, laboratory work in psychology must often be curtailed or even excluded for other than educational reasons. For example, psychology may be taught in the department of philosophy or education rather than in a separate department; or inadequate budgets for equipment, laboratory space, or suitably trained personnel will affect the teaching of the laboratory course in psychology more than it would

¹ In the case of universities, only the undergraduate liberal arts curriculum was considered.

other courses. For these reasons, only larger or better equipped colleges were sampled in this survey. At the same time, a certain number of liberal arts colleges which are not part of a university were included since their curriculum is less likely to reflect merely the requirements of graduate and professional schools. The present survey is thus concerned with the well equipped liberal arts college which maintains high academic standards with a minimum of extraneous handicaps in its curricular organization.

(1) *How many colleges offer experimental psychology and how many semesters are offered?*

A course was classified as "experimental psychology" for the purposes of this survey if it provided regular, weekly, individual laboratory work involving controlled experiments on a variety of problems in general psychology. Thus, courses dealing primarily with statistics, mental testing, or physiological psychology, have not been tabulated under the rubric of "experimental psychology." Similarly, courses furnishing only group demonstrations or a discussion of methodology with no individual laboratory work by students were not so classified. On the other hand, when the introductory course included regular laboratory experiments, it was tabulated as "experimental psychology" provided it was clear that the amount of time devoted to individual laboratory work and the nature of such work were approximately equivalent to those of "experimental psychology" courses given elsewhere. Such a classification seemed justifiable for the present purpose in view of the fact that there appeared to be closer similarity between the introductory course with laboratory given in some colleges and the "experimental psychology" courses offered elsewhere, than there was among courses taught in different colleges under the title of "experimental psychology." The basic concern in the present survey was with the amount of individual laboratory work in experimental methodology which the student receives in his undergraduate psychology curriculum, irrespective of the label of the course in which such training was provided.

All of the 75 colleges surveyed offered some experimental psychology as defined above, the number of semesters ranging from one to five, with a mode of

two. The distribution of semesters² is as follows:

Semesters.....	1	2	3	4	5
Colleges.....	18	39	9	7	2

(2) *How many colleges require experimental psychology of all their majors and how many semesters are required?*

A number of colleges do not include a statement of concentration requirements in their catalogues and a few give only point requirements without specifying courses. In such cases, we cannot assume that no specific courses are required for concentration, since such requirement may be introduced through the departmental approval of concentration programs, which often presupposes a minimum "core curriculum" for all majors. Among the 75 colleges in the present survey, 28 do not report concentration requirements in the catalogue. The remaining 47 colleges distribute themselves as follows in reference to the number of semesters of experimental psychology which they require of all majors in psychology.

Semesters required.....	0	1	2	3
Colleges.....	8	13	25	1

It will be noted that the mode is again two semesters, 25 of the 47 colleges falling into this category. Several further points may be of interest in interpreting these results:

- General psychology is the most common course requirement. Next comes experimental psychology, with statistics a not too close third.
- Of the eight colleges which report course requirements but do not include experimental psychology among such courses, most specify only general psychology. It is rare to find other courses prescribed for majors when experimental psychology has been omitted.
- In only two of the 75 colleges included in the survey were alternative programs for different "types" of majors given in which experimental psychology was not prescribed for all. These two are included among the eight colleges tabulated above as requiring no experimental psychology. To be sure, a number of colleges describe alternative programs for different "types" of majors, but in all except the two cases mentioned, experimental psychology is a common requirement for all.
- All of the above tabulations are in terms of minimum requirements. In several of the colleges, a larger

² For colleges which operate on a quarter system, the closest semester equivalent was computed in terms of weeks.

number of semesters of experimental psychology is *recommended* for all majors, although none or one semester only may be required. Similarly, among the 28 colleges which state no concentration course requirements, a few list recommended courses, experimental psychology being frequently mentioned among the latter. It is also of interest to note that the most frequently recommended courses for psychology majors outside the psychology department are biology or zoology, with philosophy a not too close second. In a few colleges, biology is prerequisite to general psychology.

PART II. THE MAIL INQUIRY

A mimeographed letter was mailed to a carefully selected group of 56³ outstanding American psychologists. The names were chosen on the basis of professional status and recognition, geographical distribution, and areas of interest and professional activity. Of the 56 psychologists, 12 are not engaged in teaching but in the application of psychology in such fields as clinical, consulting, industrial, personnel, radio, and advertising. Of those engaged in college teaching, many were included whose predominant fields of interest lie not in experimental psychology but in such areas as applied, social, child welfare, clinical, or abnormal. Geographically, the 56 psychologists are distributed among 23 states throughout the country.

(1) *Number of semesters of experimental psychology to be required of all students concentrating in psychology.*

An analysis of the 47 replies indicates, first, that all of the respondents agree that some training in experimental method is essential for all types of students concentrating in psychology and is, in fact, one of the chief contributions which the undergraduate program in psychology can make. In reference to the way in which this training can be most effectively given and the amount of time to be devoted to it, the replies fall into three major groups, with a fourth "mixed" or ambiguous category. The four categories, together with the number of respondents in each, are as follows:

A. It may be more effective to give the training

³ It was our goal to obtain the opinions of 50 psychologists. On the assumption of a 90 per cent return, therefore, 56 letters were sent out. Actually, 47 returns were received and used as a basis for the present part of the survey. The names of the respondents are available for anyone interested in examining them.

in experimental method in connection with courses in the student's chosen area of specialization within psychology—(3).

B. A uniform laboratory course in experimental psychology is essential for all types of psychology majors, but one semester may be sufficient. In this category are also included those letters stating that "at least one semester should be required."—(11).

C. A uniform, one-year laboratory course in experimental psychology is a minimum essential in the "core curriculum" of all students concentrating in psychology—(23).

M. Mixed, ambiguous, or too general to permit classification in reference to the *length of time* which should be devoted to experimental psychology—(10).

Category A. The three letters are unambiguous as to the importance of training in scientific method, but point out that the "traditional" or "drill" type of laboratory course is not as effective a way of putting such method across to the student as laboratory work on specific problems in, e.g., industrial psychology, personnel, etc. Thus, one respondent writes, "It is my impression that most undergraduate laboratory courses are *drill* courses, patterned after the laboratories in physics and chemistry. These undergraduate courses do not teach research methods....I believe it would be possible to set up an applied laboratory course, using a judicious selection of topics to introduce the student to a wide variety of currently useful technological procedures....Here we have preferred to allot such practice to the specific courses. The time may come, however, when we shall regard it as desirable to establish a general applied laboratory course for those who are not going further." It should be noted that these letters are primarily an argument against the *content* of the experimental psychology course as given in colleges which have come within the writers' experiences. This question of content will be discussed more fully as a separate question later in the report.

Category B. Typical comments follow:

"We believe the requirement of one semester of experimental psychology is essential to all students majoring in the department, and this includes those who intend specializing in industrial or clinical psychology. My own personal reaction on the subject of the experimental psychology course, is

that it really represents minimal contact with experimental methods in psychology. I would be most unwilling to see it eliminated here, and there is not one member of the department who does not agree with this attitude."

"I believe that training in experimental psychology is desirable for *all* majors in psychology. I think that there is a certain psychological sophistication that comes from a course of that sort which does not seem attainable in any other way. I sometimes find that in some of my advanced courses there are majors who have not yet taken the laboratory course. I can pick out their papers without knowledge of whether or not they have had this course. Those who have taken a laboratory course do seem to acquire a "sense of evidence" in psychological matters. For this reason I believe that some training in experimental psychology would be helpful to all undergraduates including those who plan to work in an applied field, such as industrial, clinical, or market research. . . . We require a single semester course in laboratory work of all majors in psychology. Beyond that the experimental courses consist in individual directed research."

Category C. Among the 23 replies are to be found the following illustrative remarks:

"I do not believe that enough good laboratory work can be done in the basic fields of psychology within a period of shorter than a year. Reduction to one semester would mean either too few experiments or too many "wishy-washy" demonstrations to make up for the deficiency in the experiments. . . . I should not like to see the experimental psychology course eliminated for majors. It seems to me there is such a thing in psychology as a "core curriculum" and that the subject matter of a "core curriculum" should be the common exchange of all psychologists, whether they are clinical people, experimentalists, testers, statisticians, or what not."

"I believe that students majoring in psychology should certainly have a full year of experimental laboratory work and there is no adequate substitute for such training. My experience with interns who are preparing for clinical work has strengthened any conviction I may have had at the beginning of our training program, as to the importance of the ability to think in terms of an experiment."

"I am very much in favor of requiring a full year's course in experimental psychology, not only

for those who will go on to graduate work in "pure" psychology, but also for those who intend to work in an applied field. It is my observation that solid instruction in experimental psychology is the best way to prevent the uncritical acceptance of fanciful theories and fads of technique that frequently plague the clinical field."

"I have talked over your question with our department and we are unanimously of the opinion that the requirement of a full year of experimental work should be maintained for psychology majors without distinction with respect to subsequent plans for work in clinical or other essentially non-experimental branches of the field."

Category M. The letters are varied. Some respondents are ambiguous with respect to the question of duration; others have apparently overlooked the question of time and merely write a strong plea for the inclusion of experimental psychology in the curriculum of all majors. A few specifically state that they cannot answer the question in terms of time. One respondent, for example, writes: "I would place more rather than less emphasis on it for all psychology majors, whether planning to continue with graduate work or not. The question of *time* spent on it, *viz.*, one year or one semester, is of course secondary to the ability of students of different levels of intelligence, etc., to become really proficient in the design and execution of good experiments."⁴

(2) *The value of experimental psychology for those planning to enter "applied" work.*

It is interesting to note that several respondents (15) refer specifically to the fact that in their experience in various applied fields of psychology in either civilian or military work, they have found those who were trained in experimental psychology to do better than those trained in more "applied" areas from the outset. Such letters frequently emphasize that persons who plan to enter clinical, industrial, personnel, or some other applied field are

⁴ Into *category M* has also been placed one letter which does not fall into any other group in regard to amount of experimental psychology to be required. This letter proposes a minimum of one year of experimental psychology for two groups of students, *viz.*, those who are going into graduate work and those who are going into semi-professional work without graduate training. For those taking a "culture major," however, not more than one semester of experimental psychology is advocated.

the very ones who most need a year of experimental psychology as undergraduates. A few examples of these statements are reproduced below.

"Concerning your final question, I can speak only for the clinical field. In this field I should consider a person without such training, ill-equipped to serve. Too often, those who are interested in clinical work are uninterested in strict scientific thinking but want to enter the field because of interest merely in helping people. I think such people should either go into another field such as social work, or subject themselves to the full discipline of the field of psychology."

"As for students who are planning to work in an applied field such as industrial, clinical, or market research, I would say that experimental psychology is a must whether or not they are majors in psychology."

"My personal feeling is very definitely that such an experimental course should be required of all undergraduate majors and perhaps especially those who are going into applied fields. . . . I feel strongly on this matter because I have seen too many so-called clinical psychologists who were completely unoriented in the field of psychology as a science, but who perhaps were skillful in certain techniques."

"In closing it might interest you to know that we had very good luck in the Naval program in turning some of our young experimental Ph.D.'s into clinical psychologists. The answer seemed to be that with an experimental attitude toward a problem they learned more quickly the salient facts, significant cues, and methodological approaches in the clinical field."

"If an adequate appreciation of scientific method is not laid down in advance I see no possibility that the student in the applied field can get other than a compendium of facts and opinions. . . . Having just come out of the AAF's psychological program—(an applied effort if there ever was one!)—I can say with some assurance that the best "appliers" were those with a solid scientific background."

"It has been my observation that during the war the most effective psychological work was done by men and women who had been trained in laboratory methodology and statistical techniques. This impression has been corroborated by many conversations with men in the applied and clinical fields."

"In the light of my work during the past ten years, I would certainly urge anyone going into the in-

dustrial field to take a reasonable amount of experimental psychology. I feel it is an asset to anyone working in the field of consumer or market research and am always skeptical of psychologists who have not had the benefit of considerable work in experimental design."

"I have some rather strong opinions concerning the necessity for training in experimental psychology for any person who hopes to work in the field of applied or business psychology. . . . I am thoroughly convinced that undergraduate majors in psychology should have as thorough a training in experimental psychology and scientific method as is possible to give them."

(3) *The content of the course in experimental psychology.*

A point stressed by many of the respondents is the importance of considering the content of the laboratory course in experimental psychology in evaluating its contribution to the undergraduate curriculum. On the negative side, the chief objections voiced against such courses as given in certain colleges include: too much drill, busy work, and routine repetition of experiments with predetermined results; undue attention to the manipulation of apparatus, neat notebooks, and other mechanical aspects of laboratory work; and narrow range of topics and over-emphasis of a few traditional "brass instrument" experiments.

On the positive side is mentioned the desirability of a *broader distribution of topics*, with a large number of relatively brief experiments on each topic, ranging from receptor processes, through perception, learning, motivation and emotion, to esthetic judgment, reasoning, and imagination. A further suggestion is for more attention to the *practical applications* of experimental methodology to such areas as industrial psychology, advertising, market research, and public opinion surveys. The most frequently repeated recommendation is for more emphasis upon *experimental design*, as illustrated by the formulation of hypotheses and planning of original experiments by the student, full discussion and evaluation of the experiments performed, and the selection of class experiments particularly suited to illustrate the logic of experimental method. For those colleges in which a separate course in statistics is not taught in the psychology department, the importance of including training in the statistical analysis of data

in the experimental psychology course is often mentioned.

In concluding this brief survey of professional opinion concerning the place of experimental psychology in the undergraduate curriculum, it is apparent that experimental psychology remains the basic core around which the departmental major is fashioned. Experimental psychology no longer, however, represents solely a "brass instrument" course restricted to a limited number of topics such as sensation. The conception of this course and its place in the departmental curriculum has been redefined and sharpened to include the entire gamut of psychological inquiry. To be sure, it has often been pointed out that *all* courses in modern

psychology are "experimental" in the sense that their data are, whenever possible, experimentally derived. But it is the function of the course in experimental psychology to emphasize the *methodological* aspects of psychological inquiry, and to acquaint the student at firsthand with the specialized types of relevant experimental design and with the problems and difficulties encountered in obtaining data under controlled laboratory and field conditions. It is toward the fulfillment of these objectives that the undergraduate course in experimental psychology appears to be evolving—coordinate with the rapid growth and increasing diversification of present day psychology.

A COMPARISON OF ASTP PSYCHOLOGY GRADUATES WITH OTHER GROUPS IN THE AAF CLASSIFICATION SCHOOL

ARTHUR O. ENGLAND AND HARRY LAURENT, JR.

The Ohio State University

Western Reserve University

INTRODUCTION

IN NOVEMBER of 1943, a conference was held with the G-1 of the Army Service Forces and the A-1 of the Army Air Forces. The outcome of this conference was the decision that a number of ASTP psychology majors who were then studying at various universities would take a specialized course of training in AAF classification and personnel procedures; they would then be assigned to classification duty in the AAF.

The Classification School, organized and directed by the writers for the AAF Eastern Flying Command in July, 1943, conducted this training for the ASTP groups.

This report compares the qualifications and success of the ASTP psychology majors with other groups attending the Classification School and presents a limited picture of their overall job placement and success in the Army Air Forces.

Even though the ASTP group did have certain basic college courses in such allied subjects as testing, interviewing, and statistics, there still were the particular needs of the AAF to be met. But perhaps the biggest problem facing the faculty of the Classification School was the fact that only a very small percentage of the ASTP group were members of the AAF, or had had any previous AAF administrative experience. Thus, orientation concerning the methods, forms, and procedures employed in the personnel data system of the AAF was necessary.

An unpredicted fact was that of morale. The ASTP group had undoubtedly been promised more and received less than any other Army-sponsored group. The Army took a group of very superior students, more highly educated and with higher AGCT scores than the average enlisted man and gave them special training. Many promises were

made to these men. During recruitment, the Army's need of them was emphasized. The Army published a booklet to arouse interest in the ASTP which, though it did not state outright that the graduates would receive commissions, implied strongly that such would be the case. There were even talks by high-ranking officers from Washington implying that commissions would be forthcoming along with important jobs that would make full utilization of their specialized skills and training.

Because of changing fortunes of war and shifting of needs, the majority of these promises to the psychological groups were never fulfilled. Commissions were not given. Early graduates ended up performing all kinds of odd jobs unrelated to their psychological training. After this unfortunate series of events the ASTP group under discussion arrived at Maxwell Field, Alabama. However, in spite of disappointments, these men eventually performed a valuable job for the AAF.

CLASSIFICATION SCHOOL PROCEDURES

Of the 200 ASTP psychology graduates sent to the Classification School, 46 received their training at the Ohio State University, 44 at Harvard University, 65 at Cornell University, and 45 at the University of Pittsburgh.

During the two weeks between the last regular class of the Classification School¹ and the commencing date for the ASTP class, a revised instructional manual was prepared for them. The book, which was really a 200-page mimeographed text, was entitled "Manual for Course of Instruction in AAF Classification for ASTP Graduates."

Enrichment features in the course of instruction included guest lectures, representing various perti-

¹ For a more complete description of classification in the AAF, see England, A. O., and Laurent, H., What is classification? *J. exp. Educ.*, 1946, 14, 317-333.

inent personnel jobs in the AAF; an occupational visit to a B-24 airplane maintenance hangar and flight line; motion pictures on classification and technical and nontechnical phases of flying and related activities; and lectures and slides in aircraft identification.

To combat the low morale mentioned above, furloughs were arranged for the group immediately after the completion of the 21-day course. This made it possible for them to be home for Christmas, 1943. Secondly, a straightforward, frank discussion was held with the group on their job possibilities, what they might expect, and what avenues were open. The combination of these two features produced excellent results.

PSYCHOLOGICAL TRAINING AND CLASSIFICATION SCHOOL SUCCESS

The AAF student population was divided into three main categories for the comparative part of this study. These three groups were enlisted men, henceforth referred to as "GI's," enlisted women, henceforth referred to as "WAC's," and the psychology graduates of the Army Specialized Training Program, henceforth referred to as "ASTP." Out of the 544 total school population of that date (January 1944), 310 were GI's, 34 were WAC's, and 200 were ASTP graduates.

Only a general summarized report is presented in this article because individual records of the students were not available for detailed analysis. This condition at once eliminated the possibility of computing correlation coefficients to measure the different variables such as army grade, AGCT score, length of service, and other factors. However, a brief picture of what happened to the ASTP psychology graduates once they left the universities, their success in Army training, and something about their job placement is of some general interest.

School grades were determined on the basis of a final examination and quizzes given throughout the course and recorded on the customary five-point basis.

It is obvious from the inspection of the final grades obtained that the ASTP group was superior to the other two population groups (Table 1). They obtained 31 per cent A's, which is two and one-half times the percentages of A grades of the GI's and WAC's. The percentage of B grades

obtained was about the same for all groups. The ASTP group obtained a smaller percentage of C grades than did the other two groups, and the remaining percentages in the two poorer grade categories were almost zero.

There are many factors that tend to contribute to the attainment of higher grades by this group: they had a higher average AGCT score, they all had some college education, and all had psychological training which contained many subjects directly related to military classification.

The ASTP group with a mean AGCT score of 131.1 was more than 11 points higher than the mean score of the other two groups. Inspection of the final grade distribution of ASTP's in relation to other groups, as well as the grand total grade distribution, indicates that the relationship between high AGCT scores and successful completion of Classification School is positive.

The ASTP graduates were superior to the other two groups in the matter of civilian education as shown in Table 1. They had an average of 16.4 years in school, or graduation from college. The WAC's had an average of only one year at college, and the GI's had only a little better than one semester of college. Although high school graduation was established as one of the entrance requirements to the Classification School, outstanding non-high-school graduates occasionally were admitted. The range in years of school (Table 1) shows the extent of variation.

The data are not shown in Table 1, but to be classified as a Classification Specialist prior to attending Classification School was of help in successfully completing the course. An examination of the grades made by those students who had had experience as Classification Specialists showed that none of them made less than a C in the course. In general, the on-the-job training was a contributing factor to the acquisition of knowledge of classification activities. Inasmuch as a significant part of the course consisted of acquainting the students with basic classification procedures, it was expected that individuals who had previously been exposed to these procedures would obtain a better-than-average grade.

It may be assumed that the courses taught in ASTP pertaining to testing, test analysis, inter-

viewing, and such subjects had a bearing upon the chances of obtaining superior grades.

Table 1 shows that the mean length of military service for the WAC's was less than one-half as great as the GI or ASTP groups, though there was little difference between the final grades obtained by the WAC and GI groups. The mean length of military service for the ASTP students and the GI's was about the same, though the ASTP grades

JOB PLACEMENT AND JOB SUCCESS OF THE ASTP GROUP

Perhaps the best criterion of success of a school producing Classification Specialists is the evaluation of the results of the work they performed on the job. Measuring correct job placement, maximum utilization of manpower, and efficient personnel management is not an easy task because of the extenuating circumstances that can always be cited to "justify" retaining an individual on a military job that is not commensurate with his background and training. Nevertheless, one of the best measures existing for evaluating utilization of personnel is to obtain the number of "malassignments" at any Army Base. This is usually determined by comparing the job the individual is actually performing against his classification, that is, the job he is qualified for by reason of technical school graduation or equivalent on-the-job training. This process may be further verified by actual spot checking of the men on their jobs.

Because of the changing fortunes of war it was impossible to obtain complete information on the ASTP group after they left the Classification School. However, an almost complete job follow-up could be obtained for one-fifth of the ASTP group, since they were reassigned within the AAF Eastern Flying Training Command. The other four-fifths of the ASTP group were reassigned to other sub-commands within the AAF Training Command and only partial information has been available on their job placement and ultimate job success.

One rather important follow-up device was used to gain as accurate a picture as possible of the Classification Specialists. All students were encouraged to keep in personal touch with the school and to feel free to seek advice on their individual problems. This procedure severed the red tape involved in communicating through military channels.

From the standpoint of job placement, practically all the ASTP graduates were employed immediately after graduation from the Classification School as Classification Specialists.² Later, many of the

TABLE 1
Comparison of ASTP psychology graduates with GI's and WAC's

VARIABLES	GI	WAC	ASTP	TOTAL
Number of Students..	310	34	200	544
Percentage of Group Obtaining Each Final School Grade:				
A.....	11.62	11.77	31.0	18.73
B.....	47.42	50.00	51.5	49.26
C.....	35.84	35.29	17.0	30.09
D.....	5.16	2.94	0.5	3.31
E.....	.65	0.00	0.0	.37
AGCT Scores:				
Range.....	99-153	99-146	110-156	99-156
Mean.....	119.28	117.99	131.1	123.63
Years in School:				
Range.....	8-18	9-17	13-20	
Mean.....	12.7	13.2	16.4	
Length of Military Service in Months:				
Range.....	6-69	2-12	9-37	2-69
Mean.....	16.37	6.99	16.9	15.98
Age in Years:				
Range.....	19-47	21-40	19-39	19-47
Mean.....	25.40	25.65	26.9	25.88

were much higher. Therefore it is questionable as to how much weight can be placed upon length of military service as influencing the final grade obtained.

There was little difference between population groups with respect to age. The range and the means were similar in each case. The design of this study was not such that the influence of age can be ascertained.

² Classification Specialist's job specifications are briefly: Interviews enlisted men to obtain civilian and military job history and other related information to be used for classification and assignment of military personnel. Periodically checks the military occupational specialty and duty status

ASTP graduates progressed up the job family group to become heads of personnel and classification sections, with the job title of AAF Administrative Technician. A very small percentage of them became employed in aviation research units.

Considering only the criteria factors in AAFEFTC there was a definite measure made of malassignments which is revealed in Table 2.

Considering the total population of AAFEFTC (more than 80,000), the reduction in malassignments represents a significant step toward the solution of personnel wastage. It cannot be said that the only factor affecting the reduction of malassignments within the AAFEFTC was the increase in Classification Specialists. But it is interesting to note that as the number of trained Classification Specialists increased each month, the number of malassigned personnel decreased accordingly.

TABLE 2
Relationship of percentage of malassessments in AAFEFTC and assigned classification specialists

MONTHS	NUMBER OF CLASSIFICATION SPECIALISTS	PERCENTAGE OF MALASSIGNMENTS
November 1943.....	294	2.6
December.....	503	2.5
January 1944.....	571	2.1
February.....	634	1.8

The ASTP graduates played a definite part in bringing about important reductions in malassignments in the AAFEFTC, thus aiding the achievement of greater personnel utilization. Statistical reports for the entire AAF Training Command also supported the findings of the AAF Eastern Flying Training Command.

Another source of control over effective job placement and personnel utilization was found in the official reports by Classification Audit Teams and Inspector General's Department of Headquarters, AAFEFTC, relative to personnel con-

against the qualification card of each man in the organization and ascertains whether military personnel are classified and performing duties commensurate with their military or civilian training. May administer and grade group tests of intelligence and aptitude and record data on qualification records. May prepare reports on classification and assignment.

ditions at the various air bases. Analysis of the file copies of reports after July 1, 1943 in the AAFEFTC indicated there had been a marked increase in efficient job placement as well as utilization.

Informal, personal reports from the supervising officers of the ASTP group indicated that after a very short period of adjustment to the job the ASTP graduates proved to be very capable workers.

SUMMARY

1. The ASTP group was superior to the GI and WAC groups as reflected by the final grades obtained in Classification School.
2. The ASTP groups had a much higher average AGCT Score.
3. To be classified as a Classification Specialist prior to attendance at Classification School was a definite help in successfully completing the course.
4. Length of military service appeared to have little or no influence upon successfully completing the course.
5. After completion of the classification training program, the biggest percentage of ASTP psychology graduates was employed at various Army Air Bases as Classification Specialists.
6. Concurrent with the increase of the number of Classification Specialists at the various Air Bases in the AAFEFTC, the number of malassignments was reduced appreciably. Part of this achievement may logically be attributed to the efficient job performance of the ASTP group.
7. Classification Audit Teams and Inspector General's Department reports gave further evidence that there was definite improvement in the overall efficiency of the classification program at the various air bases following the assignment of the ASTP group.
8. Informal, personal reports from Classification Officers indicate that the ASTP group in general became well adjusted to their jobs and in many instances were promoted to the top administrative jobs in the AAF. This seems particularly significant in view of the many disappointments suffered by the group relative to obtaining commissions and important research jobs. In spite of these setbacks, the psychology graduates accomplished much and their contribution to the AAF cannot be underestimated.

NAVAL AVIATION PSYCHOLOGY. IV. THE CENTRAL RESEARCH GROUPS¹

DONALD W. FISKE

Lieutenant Commander, H(S), USNR

THE reader of the preceding three articles in this series (1, 2, 3) may well have wondered how the Naval Aviation Psychology program began and how it was organized. He may have asked such questions as: How was validation carried out on the tests used by the selection and field service organizations? Who determined that men were needed for the special services? By what means was research coordinated? The answers to these questions will help to define the function of the fourth group of aviation psychologists, located in the central research organizations. Historically, two of these groups came first and continued to operate even when newer field establishments were set up or closed. Yet in a discussion of psychological activities in a Navy which stresses local autonomy, it is entirely appropriate that the many field activities should be considered before the central research groups.

THE PENSACOLA GROUP

The Aviation Psychology Section at the Naval Air Station in Pensacola, Florida, which is a few months older than the Aviation Psychology Branch in Washington, provides an excellent illustration of the part played by medical officers in bringing psychology into Naval Aviation. Psychologists were associated with the medical staff from the very beginning when a project of the National Research Council on the selection of Naval Aviators was established at the Naval Air Station, Pensacola. This was the logical place because all but the first few hours of flight training were given there. This project, originating under Civil Aeronautics Administration auspices at the request of the Navy, was staffed by men from psychology and related sciences. It investigated the relationship of more than thirty

different physiological and psychological measures to success in flight training. The staff included several men who were among the earliest psychologists to receive Navy commissions.

Selection and Classification. One of the three principal areas in which this group functioned was in the selection and classification of aviation cadets. This activity continued the studies of the National Research Council project until the validation of tests was taken over by the Washington Section. The Pensacola group quickly recognized the difficulty of obtaining adequate criteria. As we have seen before, this obstacle was constantly confronting psychologists in selection programs. To meet the situation, the H(S) officers revised flight rating scales, made intensive studies of flight jackets, and correlated specific grades with specific tests (e.g., landing grades with measures of depth perception).

An early recommendation from the Pensacola project led to the first work on the problem of classification for advanced training. One study demonstrated the inadequacy of low pressure chamber tests as an aid in this placement. These officers also played a major role in the instructor selection projects; after the institution of a selection program based on this research, they carried out studies to check its effectiveness. Related activities included the compilation of attrition figures, studies of the reasons why cadets were dropped or wanted to be dropped from training, and assistance in the maintenance of records. One psychologist contributed his services to a squadron desiring help in selecting key instructors. He asked instructors: "Whom would you pick to instruct your kid brother?" From men chosen by this question and by similar questions put to cadets, the squadron obtained highly satisfactory placements. This is one of several instances when aviation psychology turned to a sociometric technique to appraise performance.

Vision. Also stemming from the NRC project was the interest of the Pensacola group in visual

¹The opinions expressed are those of the author and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

problems, as shown by the continued research on the value of depth perception tests and of similar tests in the selection of aviators. One project sought to determine the importance of color vision for Naval Aviators and investigated the possibility of developing an improved test of this function. The reliability and validity of several visual acuity tests were examined. Again, much of the earliest Navy work on night vision was done by the staff at Pensacola. With their interest in physiological problems, it is not surprising to find them testing adaptometers and even writing a syllabus for night vision lookout training. After the establishment of the full scale program of night vision instruction for all aviators, Pensacola was the site of the school for training instructors and for developing the syllabus. Here also was carried out a major part of the research on demonstration devices and on such practical problems as the effects of prolonged exposure to sunlight upon subsequent dark adaptation.

A somewhat different project studied the effects of autokinesis. Night flyers following the single light of a plane ahead are likely to experience marked disorientation, which leads in some cases to accidents and near-accidents. This disorientation appears to be related to the autokinetic phenomenon. H(S) officers helped revise lighting systems to lessen the danger from autokinesis and carried out extensive research on the phenomenon itself.

Speech. The work on speech and communication, discussed in the preceding article (3), was begun in the Pensacola Section. Not only did this group develop methods of instruction and train many of the new speech officers, but it also carried on related research. The demonstrated need for a reliable and serviceable intelligibility test provided one problem. Although laboratory investigations had been made on this topic, the previous findings had to be carefully checked because many of them did not hold up under the actual circumstances. One project measured the effects of oxygen masks upon communication; another compared the relative intelligibility of alternative words commonly used in Navy communication procedures.

The middle element in the communication process, the equipment, was also subjected to critical review and testing. The standard speaking tube assembly may have been adequate for the low horsepower planes of two decades ago, but it was of dubious value

in the heavier trainers of today. Investigators sought by research to improve the design of the mouthpiece, the diameter of the tube, and the construction of the helmet. The H(S) officers were also called upon to subject experimentally developed models to quantitative performance checks. They went into the rarefied atmosphere of the low pressure chamber to study the effects of high altitude and accompanying cold upon speech intelligibility.

One of the functions fulfilled by psychologists during the war was the pointing out of the obvious. For instance, it is not difficult to believe that one can hear better when the earphone or speaking tube outlet is approximately centered on the ear. Yet many aviators were using helmets which fitted so badly that they had to listen with their skulls, not their ears! Merely calling attention to the condition did much to motivate those responsible for equipment toward remedying the defect.

It is not possible to include all the work of the Pensacola group under three general headings. Some of the officers assisted in physiological studies on the effects of acceleration. Psychologists lectured regularly at the School of Aviation Medicine on statistics, effective speech, and similar technical topics. They also helped the ground school instructors in standardizing the lectures. Many of the specific projects of this group will ultimately be reported in the technical journals, as will other research carried out by aviation psychologists.

THE AVIATION GUNNERY GROUP

The first psychological research on Naval aviation gunnery was carried out by means of a civilian contract under the cognizance of the central Washington group. As soon as H(S) personnel were available, officers were assigned to this project and, subsequently, to the program based on the project findings. Later, a number of aviation psychologists were included in the score of specialists attached to the Naval Aviation Free Gunnery Standardization Committee which sought, among other things, to establish uniform curricula for gunnery schools. To obtain a working knowledge of the practical situation, these H(S) officers went through the regular gunnery course. Equipped with this insight, they undertook in the gunnery field a wide variety of activities, many of which were new to Naval aviation psychology.

In developing and maintaining the gunnery aptitude battery, experience showed that it was possible to locate or devise appropriate tests which would correlate fairly well with course grades, the best available criterion. Hence the criterion itself presented the chief problem. One part of the task was to improve the reliability of the grades against which the tests were validated. The psychologists were able to demonstrate that some scores with high "face" validity were actually undependable and that scores based on actual firing at towed targets were ordinarily unreliable. In an effort to improve the training and the criterion, reliable achievement tests were developed for many of the separate subjects and for the course as a whole. When standard examinations had been constructed, the distributions of grades compiled by a central records office evoked a variety of basic questions regarding the relative weighting of different course grades. This office sent out reports which permitted each of the various schools to know the relative standing of its students in each aspect of gunnery, thus calling attention to discrepancies in the training from school to school.

A major concern of the Standardization Committee lay in the field of training. Problems of selecting and training instructors were encountered, as well as the task of writing manuals for instructors. A new, more effective system of training gunners was originated. As part of the work on training aids, the psychological group produced training films and booklets which explained to the student gunners such topics as the elements of sighting techniques and of observation from the air. Reports of gunners' actual achievements in combat were distributed to increase motivation. The group also pointed out that the students' learning and motivation both suffered if their hits and misses were not always reported to them as soon after the firing as possible. Another project investigated the relative clarity of several graphic methods for illustrating the cones of fire for aircraft, the problem being to show on paper those directions from which an airplane's armament protected it against attack.

Various training devices were experimentally evaluated by this group. In the examination of these aids, the variability due to the apparatus and the reliability of the scores had to be determined. The instructional value of camera guns was assessed and procedures for using them effectively in training were

developed. Employed as achievement examinations, these "guns" provided a practical test for knowledge of sighting theory.

The work of this group branched out into problems of design and operating procedures from the viewpoint of the man firing the guns. Equipment was tested for its efficiency and practicality. For example, a new type of gunsight was subjected to thorough trials which included a comparison with the standard sight then in use. In this experiment, the familiar problem of apparatus malfunction was not the least obstacle to be overcome.

In all of their activities, these psychologists were faced with the necessity for making sure that the training was training for the combat job. Unable to get first-hand data for a job analysis, they had to rely on the alternative of interviewing returned air-crewmen. Through an extensive program of such interviews, it was possible to analyze the practicability of the instruction received by these combat veterans and, by extrapolation, to evaluate current training.

THE CORPUS CHRISTI GROUP

The Corpus Christi psychology group, founded considerably later than the Pensacola group, expanded slowly as the need for its services grew. Basic research projects usually were directed to the older organization at Pensacola with its School of Aviation Medicine and attendant Research Laboratory. Hence the Corpus Christi group concentrated upon the many local problems at its huge training base, tending to make experimental investigations of current problems rather than to conduct long-range research projects.

Because the Corpus Christi station was similar in general function to the Pensacola station, many of the research projects at the former place paralleled those already reported for Pensacola. Flight jackets were analyzed to determine the predictive value of specific maneuver grades. Revisions of grading systems were recommended. The relationship between scores on depth perception tests and grades on maneuvers calling for that ability was determined. A check was made on the validity of the basic cadet selection tests for predicting outcome in the later phases of training. The problem of meaningful attrition reports was studied.

These psychologists at Corpus Christi also got over into classification and training problems. Their

assistance was sought in meeting the demand for screening procedures for two aviation rates. They set up a provisional method for selecting flight instructors before the nation-wide program was completed. Analysis of the instructor ratings made by cadets called attention to squadron differences in the techniques, the attitudes, and the morale of the instructors. Thus the psychologists at this station applied themselves to whatever was required by the particular situation at hand.

THE WASHINGTON GROUP

The central aviation psychology group in Washington started with a single billet in the Medical Research Section of the Bureau of Aeronautics. The organization grew from one ensign serving under a flight surgeon to a staff of a dozen commissioned psychologists assigned to the separate Aviation Psychology Branch in the Division of Aviation Medicine, Bureau of Medicine and Surgery. This expansion was partly a consequence of the development of field billets for more than seventy officers. A principal function of the Washington Branch was to help these men and through them to help Naval Aviation.

General Administrative Responsibilities. As the administrative center of the aviation psychology program, the Washington Branch was responsible for recommendations on the procurement and placement of H(S) officers for aviation work. It had cognizance over the administration and interpretation of the aviation cadet selection tests and advised on the minimum standards set for them. In addition, it maintained informal liaison with all aviation psychologists and initiated official actions as required by the needs of the field.

Primary Technical Responsibilities. The original and basic function of the Washington group was the analysis of results from the selection tests. In the light of the early findings reported by the NRC Pensacola research project, a number of tests were given an experimental trial on all aviation cadets. After sufficiently large groups had received their wings or had been washed out, their test scores were correlated with the outcome of their training. The tests were not used for actual selection until they had been cross-validated on several populations whose test scores had been locked up to prevent contamination of the criterion. The Aviation Psychology Branch maintained continuing checks upon the efficacy of

these instruments, especially when changes in procurement policy altered the nature of the applying population.

Although the need for validating the selection tests against combat criteria was repeatedly stated in official memoranda, wartime expediency prevented the establishment of this ultimate check during the early years of the war. However, arrangements were eventually made for several psychologists to go out to the fleet. They faced the familiar problem of developing a satisfactory criterion. Number of planes shot down, decorations, and other alleged measures of proficiency were examined and found inadequate. After considerable preliminary research, a nominating technique was established which yielded dependable results. Aviators with combat experience were asked to name two pilots with whom they would most like to fly in combat and two with whom they would least want to fly. They were also asked to indicate the reasons for their choices on a checklist prepared from the free responses of previous respondents.

Two conditions were responsible for the success of the technique. Wherever possible, the H(S) officers lived with the squadron and got to know its members on an informal basis so that the actual request for their help, although officially sanctioned, did not come from a total stranger or through impersonal channels. The investigators were also supported by an official guarantee that the pilots' opinions would be treated confidentially and would be used for research alone. Inspection of the preliminary free response materials and analyses of the nominations gathered in the major project left no doubt that the pilots had cooperated in a more than satisfactory manner.

There were other developments of this combat criterion project carried on by the Washington group. Representatives tried out the nominating technique at a pre-flight school to determine whether those characteristics mentioned by combat aviators which did not refer to pilot skill could be identified early in training. The results suggested that attributes like leadership and teamwork could be judged by fellow cadets although there was no guarantee that these judgments would agree with those made when these men reached operational flying. In another study, the extreme groups identified by the nominations of combat pilots were compared in terms of their

athletic records, as a corollary to the basic research on the validity of test scores, age, and other possible predictors of combat proficiency. Such subsidiary investigations, carried out at the request of another Bureau, illustrate the service function of the Aviation Psychology Branch and indicate that administrative boundaries did not restrict its areas of usefulness.

Validation was not the only technical responsibility of this central research group. It also developed and standardized new tests. It exchanged information with the Army Air Forces testing program so that each psychological service could benefit from the work of the other. The section checked the accuracy of scoring done in the field and maintained card files for record and research purposes. Statistical breakdowns of attrition data gave the frequency of various reasons for failure as well as the relative ability of the tests to predict each type of failure. The different parts of the selection battery were correlated with age, education, previous flight training, and other relevant factors. It was the responsibility of the Aviation Psychology Branch to make such administrative recommendations as the results of these analyses warranted.

Other Services. Just as the members of the field organization inevitably became associated with duties outside the scope of their initial function, so the Washington group found itself devoting proportionately less attention to pilot selection tests because of the steadily increasing number of requests for help on other problems. Undoubtedly, this shift of emphasis resulted in some neglect of the selection program in which there was always considerable room for improvement. However, since by that stage of the war it took as much as two years for an accepted applicant to reach combat operations, perhaps the concern with more immediate problems was justified.

A battery of selection tests for flight instructors was established on the basis of research carried out by this central research group with the collaboration of the field service organization. In this study, several criteria were tried and found wanting. For example, while the proportion of each instructor's students completing training is a clear cut datum which would seem to be a useful criterion, inadequate records and small samples made it undependable. The composite criterion finally selected was based

primarily on the rating of those who had the best chance to observe the instructor's performance, namely his students, and secondarily upon inspectors who checked the work of each instructor. Using extreme groups, it was possible to derive scoring keys which stood up under cross-validation. The validated measures were not intelligence tests but rather questionnaires regarding preferences for assignments and attitudes toward instruction.

The group was asked to help select Link Trainer instructors, control tower operators, and nonpilot navigators. In one case, the required numbers were so small that exact validation would not have been economical or statistically reliable and recommendations had to be based upon technical experience with similar groups. In other cases, it was possible to validate selection measures against outcome in short training courses.

There were other projects in the field of training. An example of cooperative research where the Washington group worked with officers in the field can be found in the evaluation of the Link Synthetic Flight Trainers. The question was whether this device could be used as a training aid to save flight time. The experimental design was set up by the Aviation Psychology Branch in conjunction with cognizant Navy Department officers, and an H(S) officer was assigned to the field station where the project was carried out. His responsibilities included setting up the experimental and control groups, assisting in the compilation of the records, and watching for the unwitting introduction of extraneous influences upon the data. In a project requested by the Naval Air Training Command, correlations were run between test scores and grades on specific flight maneuvers. The Washington group was also asked to set up and conduct an experiment to determine the relative value of two synthetic gunnery trainers. It is perhaps typical of the difference between wartime improvisations and precise experimental designs used in pure research that the task was complicated by the lack (at that time) of any dependable measure of gunnery proficiency.

The Aviation Psychology Branch was called upon to apply quantitative methods to nonpsychological problems. Thus a Bureau medical officer enlisted help in making a statistical evaluation of the effectiveness of oxygen indoctrination. A second medical project was the intercorrelations of various meas-

ures of cardiovascular efficiency with each other and with age. Again, in cooperation with the cognizant section in the Division of Aviation Medicine, the Branch developed a record form for the flight physical examinations which was adapted for the IBM test scoring machine. It made possible the rapid check of each completed blank to determine whether it required detailed consideration by the reviewing officer and also enabled the ready compilation of distributions by the use of the graphic item counter. The Psychology Branch was also called upon to review the experimental design and the statistical treatment of data in a wide variety of reports reaching the Division.

Another example of the extension of the Branch's services to the review of experimental design was the assignment of the first psychologist to the Office of Research and Invention of the Navy Department. His function was initially the review of the experimental designs for research proposals to be carried out under Navy contract. Through the efforts of two members of the Branch who had additional duty in OR&I, an informal Intra-Navy Personnel Research Committee was established to evaluate these proposals and to coordinate the efforts of the several Naval groups performing psychological research.

These papers on Naval Aviation Psychology would be incomplete if they did not call attention to what the psychologists themselves gained from their military experience. The contrast between actual statistical findings and theoretical expectancy left a marked impression on them. Here was a rare opportunity to apply statistics to data from much larger groups than the usual laboratory samples. It was commonplace to observe that, for several populations that were apparently homogeneous in every relevant particular, different values would be obtained which varied beyond the bounds set by familiar expectancy measures. This H(S) group returned to their peacetime work with a healthy skepticism about the stability of any findings based on populations of two or three hundred cases.

Another lasting lesson was the necessity for more attention to criteria. Psychologists have been so

much preoccupied with the immediate task of constructing reliable measuring devices that they have often slighted the criterion itself. It was the experience of the aviation group that constructive efforts to improve the reliability and the significance of criterion measures deserve at least as much attention as that given to the predictor itself.

Wartime psychologists also learned much about the communication of facts and findings to lay personnel. Considerable skill is required in stating the administrative implications of an r of .31 ($N = 2485$) to a policy-making officer. Interpretations by means of simple frequencies or percentages and estimates of time or money saved can talk more persuasively than statistical levels of confidence or indices of determination. One simple perspective bar diagram showing the percentages of failures for various combinations of two selection tests and also indicating by primary colors those combinations with comparable percentages proved to be aviation psychology's best salesman.

In their wartime experience, H(S) psychologists learned effective methods for disseminating technical knowledge to the men who use it. It is a sizeable jump from teaching college students whose attention is obtained either by regulation or by interest to selling safety practices and oxygen or communication procedures to men who do not know that they must use the facts for their own protection. Finally, and most significant of all, this H(S) group acquired a strong conviction that psychology's knowledge, techniques, and attitude or way of thinking have many diverse applications, some of which have been unforeseen. The wartime demonstration of this fact will exert considerable influence on the postwar thinking and activities of psychologists.

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PROFESSIONAL FRUSTRATION IN GOVERNMENT PSYCHOLOGISTS¹

WILTON P. CHASE

Veterans Administration, Washington, D. C.

Psychologists in the government service are predisposed to suffer from an occupational malady which can be descriptively labeled "professional frustration." This condition has become more and more apparent during the war years and occurs most often among psychologists who left university positions to enter the armed services or to accept appointments in various military and government establishments. No systematic study has been made for the purpose of collecting data to support the circumstances described in this article. However, the expressed opinions of many psychologists who have had the experience of trying to realize professional values which are often in conflict with those usually held by non-professionally trained administrative officials are the basis for explaining the condition referred to here as "professional frustration."

The typical factors which produced this condition among psychologists in the armed forces can be described as follows: Most psychologists were assigned to duties where they were responsible for the operation of various phases of the personnel programs. They were responsible in turn to administrative officers who usually had little or no understanding of the principles and techniques of personnel management, let alone any appreciation of the psychological foundations for such work. The latter were dependent upon the technically trained psychologists to develop and apply proper personnel methods. These administrators reserved, however, their prerogatives to determine policies and to approve procedures. They rightfully considered it necessary to retain the authority for determining policy because they were entrusted with the respon-

sibility for accomplishing the mission of personnel work in the organization of the armed forces. They were conscientiously concerned with fulfilling this mission in ways which in their judgment were the most efficient, expeditious and economical. The psychologists, on the other hand, who actually instituted and performed the operations as prescribed in regulations and directives were concerned more with the welfare of the individual because their professional viewpoint is that personnel procedures are devised to effect the proper placement and management of persons. Very often this viewpoint was in conflict with what their superior officers considered to be proper because of "administrative necessity."

Psychologists who consistently failed to compromise their professional concern for individuals with the dictum of administrative necessity as prescribed by their superiors were classified as "long haired" and more often than not lost any chance for effectiveness which they might have had. Most psychologists, however, did compromise because they realized that limited progress toward achieving an ideal goal was better than none at all. They hid the fact that they were suffering from "professional frustration," and as individuals performed their duties in a most admirable manner. Because of their willingness to do the best that could be done in applying psychological procedures, as individual psychologists they were able to contribute much to the stature of psychology in the eyes of those who were responsible for the administration of the personnel programs in the armed forces. They ably used the procedures and techniques which were authorized and accepted their position as *technicians*. There was a common saying among them which aptly describes the situation in which they found themselves: "They held positions of great responsibility with little authority."

¹ The opinions expressed in this article are those of the author and are not set forth in his capacity as an official of the Veterans Administration and, therefore, approval of the article or concurrence in the statements by the Veterans Administration is not to be implied.

Very little was contributed to psychology as a profession by the individual efforts of psychologists in the armed services. If psychology had been accorded a professional status it would have required a distinctive corps to which psychologists could have been assigned as physicians are assigned to the Medical Department. In such a distinctive corps professional standards of work are maintained and are fully accepted as being indispensable to the successful operation of an armed service. Without a separate organization of their own, psychologists were absorbed into various branches of the services as *technicians* where their knowledge and skills were utilized most effectively as adjuncts in administering the various programs which were concerned with personnel matters.

If there had been a distinctive branch of service which was exclusively staffed by trained psychologists, there could have been possible a thorough-going development of psychology as a profession within the military framework. With such an organization psychologists could have been responsible for the development of policies and procedures as well as for carrying out operations which involved the use of psychological knowledge and skills.

The part that clinical psychologists played in the Medical Department should not be overlooked in any discussion of the role that psychologists played in the armed services. It can be assumed that when psychologists elect to work for another professional group such as the psychiatrists, they can expect to be relegated to the position of *technicians*. An engineer or physicist working for a psychological laboratory to aid in developing apparatus would likewise be considered a technician at the service of psychologists. This is not to say or to imply that psychologists should be considered any less competent or less imbued with a professional viewpoint when employed in such capacities. In fact, those psychologists who are employed in the service of other professional groups have a greater chance to cultivate successfully a professional viewpoint and to satisfy professional standards in their work than other psychologists whose work is supervised by nonprofessionally trained persons. By working with and for persons who are trained professionally in their own fields, they find a climate which is conducive to the acceptance of the judgment of psychologists about psychological matters.

The situation for psychologists which has been described as prevailing in the armed services is also true for those who are employed in government agencies. They are absorbed as individuals or as groups to work under trained government administrators who must first of all be concerned with following a legal viewpoint rather than a professional one. It does happen occasionally that psychologically trained persons are appointed to administrative positions at a level of responsibility where they can influence policies and procedures for a program involving personnel matters of a technical nature. However, there is no assurance that such will happen regularly.

The services of psychologists are often necessary to enable an administrator to develop an authorized program which deals with personnel problems and procedures. Sometimes a law specifies a type of personnel service which is to be rendered to individuals. Psychologists are known to possess the requisite knowledge and skills for performing various personnel services, so they are employed to advise administrators concerning the way in which such services should be rendered in order to attain in the most effective manner the results which the law intends. When administrators employ psychologists on their staffs as professional experts, they are not concerned with the advancement of psychology as a profession, but are interested only in utilizing the technical knowledge and skills which individual psychologists possess.

Administrators conscientiously assume their obligations and deliberate carefully before establishing policies and procedures to effectuate them. They consider that they have done the correct thing when they employ trained psychologists to administer the technical psychological procedures which it may be necessary to include in a program. However, their interest in psychological procedures usually ends when they consider that they have included those which seem necessary to produce the results which the law intended. They are concerned only with the minimum psychological procedures necessary to render an acceptable and satisfactory personnel service to the public. In instances where administrators do have a good professional training, the personnel programs for which they are responsible demonstrate superior accom-

plishments readily identifiable as such when objective standards are applied.

Again, as in the armed services, psychologists are interested in rendering the maximum possible service. This desire is motivated by the acceptance of a professional code of ethics which incorporates the idea that all the results of scientific investigation in the field of psychology should be made available and utilized in situations which are designed to promote the welfare of individuals. Because psychologists have professional aspirations which are continually in recurring conflict with the "administrative necessity" viewpoint of administrative officials, they must again and again compromise their ideals with reality. Hence, the continual recurrence of "professional frustration" is engendered.

Psychologists as individuals are practically powerless to initiate measures directed toward correcting the circumstances which limit the extent to which they are permitted to develop their ideas for rendering a well-rounded and fully-developed program of personnel service to individuals within the framework of government administration. If they wish to be idealists about what psychology should offer to people in guiding their development and adjustment, they must seek the university life which provides a climate in which they can discuss and teach their ideas about what should be done without ever facing the reality of attempting to place them into practice under the restrictions imposed by the policies and procedures of a government agency. Academic psychologists freely write and talk about imperfections of psychological programs conducted by government agencies. Such criticism does little or no good. For the most part it is unrealistic, because the authors of it usually have never had to

adapt to the situation which exists in a government agency.

Psychologists now at work for the government are in a position where only limited professional objectives can be realized. They must rationalize their willingness to accept circumstances by contending that it is better to have some acceptance of the fact that psychologists should be employed to apply psychological methods than to have little or no use made of them or to have non-psychologically trained people attempt to apply them.

If in the future psychologists aspire to achieve recognition for their ideas in determining policies and procedures for managing and directing various personnel matters for which government programs are designed to deal, they can take two steps by acting in concert as a group. First, psychologists can acquire professional status if their own professional organization establishes a program of certification for properly qualified psychologists. Second, when a government program is to involve the application of psychological procedures, the professional psychological organization can then insist that only certified psychologists be employed to administer and operate it and that certain minimum standards of professional performance be achieved before it is accorded professional recognition.

Until psychology takes steps to establish itself as a strictly professional field of endeavor, it will continue to suffer from a lack of acceptance as such by military and government administrators. Until that time arrives, psychologists must be content to serve in the capacity of technical specialists if they accept appointments to military and government positions, and they also must accept the fact that they will be plagued by the condition of "professional frustration."

Across the Secretary's Desk

FAVORITE PSYCHOLOGICAL JOURNALS

For several years the APA has offered all its publications at a special club-rate to members, but now the number of journals is too great to permit selling them for the club price of former years. To secure information on desired groupings, an advisory ballot was circulated to all members last summer. Three club groups were then chosen. Approximately 40 per cent of all members subscribed to one or another of them, and a few to individual journals.

It was easy to satisfy those members who were willing to pay a higher price to receive all of the journals. Approximately 35 per cent of all club-rate subscribers chose this group.

Selecting the journals to include in other groups was more difficult. Tabulations of the rank order of preference of those people who were not interested in receiving all journals made it possible to select an "applied" journal group and an "experimental" journal group which seemed to satisfy the great majority of respondents. But most people whose first choices fell in the applied group wanted the *Psychological Review* more than they wanted some of the other applied journals. It was therefore added to the applied journals. Approximately 40 per cent of all club-rate subscribers chose this group.

Most of those whose first choices fell within the experimental group wanted the *Journal of Abnormal and Social Psychology* more than they did some of the other experimental journals. It was therefore included with the experimental journals to make up the third club group. Approximately 25 per cent of all club-rate subscribers chose this group.

The most frequent supplementary comment on the ballots was a request that each person be allowed to pick out his own five or six preferred journals. Some day that may become possible. It is not now. Allowing each person to make up his own group of five journals would allow 15,120 combinations. The 5,000 members would not be able to exhaust all these possibilities, but they would probably do their best. The detailed individual book-

keeping necessary would make the cost to the members prohibitive.

The clubs selected are those which satisfied the greatest number of members. The minority who did not find their own preferences offered may find some satisfaction in this explanation and may claim unusual or unique reading preferences.

STANDARD SCORES AND PERCENTILE SCORES

The experience of World War II demonstrated that standard scores can be used by large groups of people who lack statistical training. Army and Navy officers were taught to record test results in standard scores and to interpret such scores when they examined the personnel record cards of men for whom they were considering assignments.

The Adjutant General's Department of the Army reported scores on a scale with a mean of 100 and a standard deviation of 20. The Bureau of Naval Personnel used a mean of 50 and a standard deviation of 10. The Navy's system allows two-digit coding and avoids confusion with IQ norms.

The psychologists who introduced these scales were well aware of the common civilian practice of reporting test results in percentile terms. They took advantage of the fact that military officers were, in the main, unacquainted with percentile scores. It was possible to teach a good system without the necessity of unlearning a bad one.

Now that psychologists are mostly back in civilian clothes, those who work with tests are likely to revert to the use of percentile scores because other psychologists, school teachers, deans, and administrators are acquainted with percentile scores and find them easy to explain. Yet standard scores have so many statistical advantages over percentile scores that their use should be almost universal. Let us stop the bad practice of reporting scores on group tests in percentile terms and demonstrate that civilians are able to learn and use a scale which Army and Navy personnel learned readily.—DAEL WOLFLE

Psychological News and Notes

JAMES HENRY LEUBA, 78, professor emeritus of psychology at Bryn Mawr, died at Winter Park, Florida on December 8, 1946.

EUGENE CHARLES ROWE, 76, formerly head of the department of psychology and education at Central State Teachers College, Mount Pleasant, Michigan, died December 31, 1946. He had been a life member of the APA since 1944 and a member since 1910.

IRVING A. BARRETT was killed in action in the Pacific in July 1945. He was an associate member of the APA.

CYDIE H. COOMBS has joined the faculty of the University of Michigan where he will be assistant professor in psychology and research psychologist in the Institute for Human Adjustment. His most recent position was in the Adjutant General's Office. JOHN B. CARROLL, previously with the Aviation Psychology Division, Bureau of Medicine and Surgery, is replacing him in the Adjutant General's Office.

DANIEL BROWER is now with the Personnel Laboratory in New York City as director of psychological services.

The Council of Representatives of the American Psychological Association has elected the following people to membership on the new American Board of Examiners in Professional Psychology: MARION A. BILLS, JOHN G. DARLEY, CARLYLE JACOBSEN, JOHN G. JENKINS, GEORGE A. KELLY, DAVID SHAKOW, CARROLL L. SHARTLE, DAVID WECHSLER and F. L. WELLS.

RICHARD E. FOX, formerly director of the University of California Veterans Advisory Service, has joined the staff of the University of Colorado as an associate in education and head of the department of testing and evaluation.

CLARENCE A. MAHLER has been appointed acting chief of the newly established VA Guidance Center at the University of Colorado.

EVA RUTH BALKEN, formerly assistant professor of psychology, Division of Psychiatry, University of Chicago, is studying in London with Anna Freud.

HAROLD A. EDGERTON, formerly director of the Occupational Opportunities Service and professor of psychology at the Ohio State University, will now devote full time to teaching and research in the department of psychology. FRANK M. FLETCHER has been appointed director of Occupational Opportunities Service and assistant professor of psychology.

AARON H. CANTER has been appointed assistant in guidance in the Psychological Services Division at Teachers College, Columbia University. He had been with the supervisory staff of the Vocational Rehabilitation and Education Division of the VA.

EDWARD N. BRUSH has returned to the University of Maine as acting dean of graduate study and professor of psychology after three and one-half years in the army. He received the Army Commendation Ribbon for his work as Chief of the Counseling Branch, WD Separation Center, Fort Devens, Massachusetts.

C. ESCO OBERMANN has been appointed Director of the Vocational Rehabilitation and Education Service of the Branch 8 office of the VA at Fort Snelling, Minnesota.

LAURANCE F. SHAFFER, editor of the *Journal of Consulting Psychology*, has selected the following associate editors: EDGAR A. DOLL, WILLIAM A. HUNT, E. LOWELL KELLY, MORRIS KRUGMAN, BERTHA M. LUCKEY, FRED MCKINNEY, CATHARINE C. MILES, CARL R. ROGERS, and R. NEVITT SANFORD. The associate editors were nominated by the Executive Committee of the Division of Consulting Psychology, the Division of Clinical and Abnormal Psychology, and the Division of Counseling and Guidance Psychologists.

ARNOLD H. HILDEN is now associate professor in the recently organized Department for the Study of

Human Growth in the University of Colorado School of Medicine.

B. F. SKINNER of Indiana University has been appointed the William James Lecturer in Psychology at Harvard University during the fall term of 1947. Former William James Lecturers in Psychology were John Dewey, Wolfgang Köhler, Kurt Goldstein, and E. L. Thorndike.

The subject of Professor Skinner's ten weekly lectures will be the psychological analysis of verbal behavior. He will also offer a graduate seminar on the principles of behavior.

There have been recent changes in the department of psychology at North Carolina State College. WILLIAM McGEHEE, formerly chairman of the department, has resigned to become Director of Personnel Research for Marshall Field and Company at Spray, North Carolina. D. J. MOFFIE will succeed him as chairman, and ALAN GRINSTED, formerly associate professor of psychology at Rhode Island State College, will join the department as an associate professor.

REBECA MILES, professor of psychopedagogy at the Institutos Normales of Montevideo, Uruguay, has been appointed extern at the Wichita Guidance Center. Professor Miles has been awarded maintenance and travel grants by the U. S. Department of State, through the Institute of International Education, to study child research and service centers in the United States.

J. W. BOWLES JR. has been appointed psychological examiner at the Wichita Guidance Center.

THOMAS M. HARRIS, research fellow in clinical psychology at Harvard University and lecturer in the management training program at Radcliffe College, has joined the firm of Harris, Rust, and Hawthorne, Personnel Research Consultants, Boston.

New members of the psychology staff at Cleveland College, Western Reserve University are: ELEROY STROMBERG, RICHARD WALLEN, PETER J. HAMPTON, and WESLEY ALVEN. The department will emphasize work in vocational guidance and industrial psychology.

The Mississippi State College for Women has established a separate department of psychology. CARROLL H. LEEDS, formerly head of the department of education and psychology at Westminster College, New Wilmington, Pennsylvania, has been appointed head of the new department. Other members include: LULA STEVENS, associate professor, ALICE WILDMAN, associate professor, and NELLIE S. KEIRN, dean and vice-president of the college.

LOIS ADAMS, formerly associate professor of psychology at Pratt Institute, is now with the VA Guidance Center at the Polytechnic Institute of Brooklyn.

ROBERT S. SACKETT has joined the staff of the Psychology Section, Missile Control Division at the Naval Research Laboratory, Washington, D. C. Formerly he was associated with Edward Howard and Co., Cleveland, Ohio, as an advertising and public relations consultant.

GORDON L. MACDONALD, formerly counselor with the Occupational Opportunities Service of the Ohio State University, is now assistant professor of psychology at the University of Toledo.

N. HENRY PRONKO has been appointed acting head of the psychology department of the University of Wichita.

J. LEWIS VAGER has accepted an appointment as clinical psychologist at Vaughan Hospital, Hines, Illinois.

HERBERT S. LANGFELD, Princeton University, has been appointed Permanent Secretary of the International Congress of Psychology to fill the vacancy created by the death of Professor Edouard Claparède.

C. GILBERT WRENN, professor of educational psychology at the University of Minnesota, has received the Bronze Star Medal from the Navy. His citation reads in part as follows: "For meritorious service in connection with operations against the enemy while attached to the Staff of Commander Service Force, U. S. Pacific Fleet . . . serving as Personnel Officer of the Advanced Base Section . . . he skillfully established new procedures and methods

and selected and trained officers and men to carry them to completion."

The Minnesota Psychiatric Institute, organized in 1946 by Dr. ERIC KENT CLARKE, chief psychiatrist of the Manhattan Project at Oak Ridge, Tennessee, announces that RAY H. BIXLER has joined their staff. Drs. STANLEY G. LAW and WILLIAM FLEESON, associates of Dr. Clarke at Oak Ridge, joined the staff last July.

Last November L. L. THURSTONE of the University of Chicago gave a series of four lectures to a group of men interested in market research and advertising. The purpose of the lectures was to describe the application of psychological measurement methods to the study of market research and consumer preference problems. The final lecture of the series was given before a joint meeting of the American Statistical Association and the Illinois Market Research Association.

The members of the executive council of the Minnesota Society for Applied Psychology are: STARKE HATHAWAY, CLIFFORD JURGENSEN, JOHN G. DARLEY, CORNELIA D. WILLIAMS, and LINDSEY R. HARMON.

HENRY P. BIRMINGHAM, THOMAS G. HERMANS, ALSTON S. HOUSEHOLDER, WILLIAM E. KAPPAUF, and FRANKLIN V. TAYLOR received Development Awards from the Bureau of Ordnance for their research on lead-computing gunsights. They were members of Project N-111 under the Applied Psychology Panel.

GRACE RUBIN-RABSON has published an article, "Psychological Counseling," in *Hygeia*. It is suitable for the layman and explains the various functions of the neurologist, the psychiatrist, and the psychologist. Reprints are available from Dr. Grace R. Rabson, 2440 Fairfield Ave., Ft. Wayne, Indiana, for any psychological or other reputable group that might find them useful.

A conference will be held at the University of Pittsburgh, March 5-6, on recent developments and probable future trends in seven fields of psychology. The speakers will be: CARL ROGERS, B. F. SKINNER, E. LOWELL KELLY, RENSIS LIKERT, JOHN C.

FLANAGAN, ROBERT SEARS, and CLIFFORD T. MORGAN.

The conference is intended primarily for psychologists and for graduate students of psychology. There will be no charge for attendance, but admission will be by ticket only. Requests for tickets, addressed to the Department of Psychology, University of Pittsburgh, will be filled in the order in which they are received.

The Inter-Society Color Council will hold its sixteenth annual meeting February 24-25 in New York City. For information write P. O. Box 155 Benjamin Franklin Station, Washington 4, D. C.

The U. S. Civil Service Commission has established a Committee of Expert Examiners to aid in developing an examination for research psychologist positions in the Federal Service. LOUIS M. HEIL, CLYDE H. COOMBS, and ANTHONY C. TUCKER represent the War Department, DAVID G. PRICE, ALSTON HOUSEHOLDER, and HARRY OLDER the Navy Department, and JOSEPH M. BOBBITT and ALBERT H. ARONSON the Federal Security Agency. L. L. THURSTONE and JOHN G. JENKINS are consultants.

The Department of State announces that grants providing travel and maintenance will be awarded to candidates for study in other American republics. The candidates must have the bachelor's degree and must be engaged in graduate work. Preference will be given to projects on the basis of merit and with reference to their usefulness in the development of broader understanding between the United States and other American republics. Applications can be obtained from the American Republics Section, Division of International Educational Relations, U. S. Office of Education, Federal Security Agency, Washington, D. C. They should be returned not later than March 1, 1947.

The Test Division of the Psychological Corporation has in operation an installation of IBM punch card equipment which is available at moderate cost to psychologists or graduate students with appropriate problems.

The Veterans Administration Vocational Advisers Association of Chicago, HAROLD L. DUNSKY, chairman, extends an invitation to VA training officers, appraisers and other workers in the field of psychology to become affiliate members. Dues are one dollar a year. Meetings are held monthly. Further information can be obtained from Dr. Saul Kasman, 4355 South Sawyer Ave., Chicago 32, Illinois.

Applications to the National Research Council Committee for Research in Problems of Sex for financial aid during the fiscal year beginning July 1, for work on fundamental problems of sex and reproduction, should be received not later than April 1. They should be addressed to the chairman, Dr. Robert M. Yerkes, Yale School of Medicine, New Haven 11, Connecticut. Although hormonal investigations continue to command the interest and support of the committee, preference, in accordance with current policy, will ordinarily be given to proposals for the investigation of neurological, psychobiological, and behavioral problems of sex and reproduction.

The Connecticut State Hospital, Middletown, Connecticut, announces a vacancy in the Psychological Laboratories, under the supervision of Jules D. Holzberg. The salary will be \$2520 to \$3240. Full maintenance at the hospital may be provided at a deduction of \$316 per year. An individual with an MA and clinical experience is preferred. Applications should be submitted to the Superintendent of the Connecticut State Hospital.

The Kansas State Receiving Home for Children, Atchison, Kansas, announces an opening for a consulting psychologist. The position involves diagnostic work with delinquent and behavior problem children. Although a woman is preferred, anyone qualified will be considered. The PhD in psychology is required and clinical experience is highly desirable. The salary range is from \$3000 to \$4800, depending on individual qualifications. Anyone interested is invited to apply to Robert C. Kammerer, Director, Kansas Receiving Home for Children, Atchison, Kansas.

The George Washington University, Washington D. C., is looking for summer school instructors in several fields of psychology. Instruction is for a seven-and-a-half-week term beginning either on June 2, or July 24. Interested persons should write Dr. Thelma Hunt, Executive Officer, Department of Psychology.

The Guidance Center of the Bureau of Mental Hygiene, Houston, Texas announces an opening for an assistant clinical psychologist. Interested persons should write to Mrs. Mary L. Rothschild, Chief Psychologist, Guidance Center, Bureau of Mental Hygiene, 304 McIlhenny, Houston 6, Texas.

The Bureau of Maternal and Child Health, Madison, Wisconsin, has an opening for a Psychologist III. Applicants must have a BA, some graduate work, and three years experience in clinical psychology, at least two of which have been in child guidance work. The salary is from \$260 to \$310. Applications can be obtained from the Bureau of Personnel, Madison 2, Wisconsin.

Farragut College has positions available on the teaching staff of the department of psychology, and on the staff of the Farragut College Guidance Center. Inquiries should be addressed to Dr. I. A. Fosberg, Assistant Personnel Director, Farragut College, Farragut, Idaho.

The U. S. Civil Service Commission announces examinations for the positions of Clinical Psychologist and Research Psychologist. Clinical Psychologist positions will have a salary range from \$4149 to \$7102. The salaries for Research Psychologist range from \$4902 to \$9975. Applications for the Clinical Psychologist and Research Psychologist examinations will be accepted until further notice by the Civil Service Commission. Some Research Psychologist positions will be filled immediately. Persons interested in these positions should apply at once. Information and application forms may be obtained from most first- and second-class post offices, from Civil Service regional offices and from the U. S. Civil Service Commission, Washington, D. C.

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